

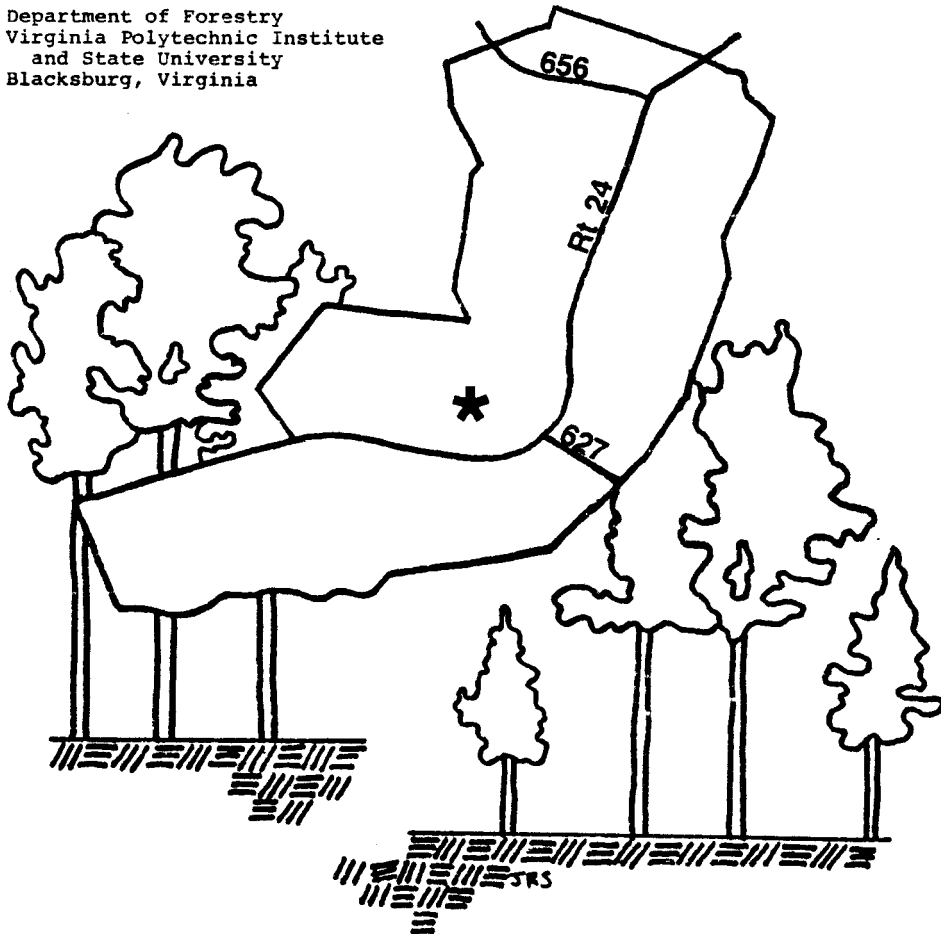
# APPOMATTOX COURT HOUSE NATIONAL HISTORIC PARK FOREST MANAGEMENT PLAN

Appomattox, Virginia

by

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for  
United States Department of the Interior  
National Park Service  
Mid-Atlantic Region  
Philadelphia, Pennsylvania

April, 1986



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## EXECUTIVE SUMMARY

A forest management plan is presented for the 1320 acre Appomattox Court House National Historic Park. Much of the 735 forested acres are currently going through a successional transition from one seral stage to the next. As a result, natural tree mortality, disease, insect infestations and wildfire threaten the vitality and integrity of the landscape resource of the park. Overall forest management objectives for the park have been clearly defined. Eleven forest stand types have been identified and further delineated into a total of 48 compartments/management units. A description, present condition, management objectives and recommendations, as well as a statement of projected future stand condition, are given for each of the 48 compartments.

Initial forest management activities in the park should focus on (1) the Virginia pine stands which are greater than 50 years old and (2) the visual screens along the perimeter of the park. The 50+ year-old pine are suffering from wind and ice damage, are in a rapid stage of decline, and are in need of salvage and/or sanitation cuts. The visual screens, because of their importance, should also receive priority attention. The majority of these stands are young and need timely forest management to keep them continually effective. Therefore, the recommended thinnings and/or plantings should be carried out as soon as possible.

Timely management activity needs to occur in the younger pine types (pine 31-50 years old and pine 11-30 years old) so that these two stand types make the successional transition from pure pine to mixed pine-hardwood and finally to hardwood types in a healthy and vigorous manner.

Hardwood types within the park are generally healthy state; however, because of the imminent threat of the gypsy moth, it is imperative that the stand condition be evaluated on a continuing basis so that management decisions can be made should stand integrity be threatened.

Cattle should be excluded from full-canopied stands if healthy and vigorous trees are to be maintained and the management objective is to maintain forest cover in the future.

It is recommended that the soil survey and associated interpretation be completed as soon as possible for all those areas within the park for which soil surveys have not been completed.

Finally, there is a need to evaluate the present administrative structure and make appropriate adjustments, if warranted, so that the Park Superintendent will have the professional expertise, technical skills, and resource support required to properly implement this forest management plan should it be adopted.

## PREFACE

The mission of the U.S. Department of the Interior - Park Service is to manage national parks, monuments and similar reservations "to conserve the scenery and the natural and historic objects and the wildlife therein, and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for enjoyment of future generations." To this end, the Department of Forestry at Virginia Polytechnic Institute and State University entered into a contract with the U.S. Department of the Interior - Park Service, Mid-Atlantic Region to develop a forest management plan for the Appomattox Court House National Historic Park that could serve as a base document for management plans at other historic sites.

National Park Service (NPS) policy in historic zones has focused on preserving man-made and natural landscapes which project a desired image that reflects a historical event or depicts a particular era which is specific for the particular park. Often this has meant that forest and associated non-forested landscape resources at these parks were managed as natural, non-manipulated ecosystems. With the passing of time, these forested landscapes have progressed successionally to the point where they are approaching or have already passed into the next seral stage. These transition stages are often quite dramatic, and the resulting forested ecosystems may be quite different from the previous stage. In conjunction with these shifts, actual or potential disturbances such as natural mortality, disease, insect infestations, and fire may become serious management problems. As a result, the aesthetic and cultural aspects of the forested landscape may be impaired to the point where the historical event or era is no longer reflected or park resource management objectives are no longer met. These forest complexes must be managed according to NPS policy and park objectives. It is imperative that, in order to meet specific cultural and natural resource objectives at a given park, forest management objectives must be clearly defined and prescriptive strategies implemented to ensure that the desired forested landscapes are maintained in a vigorous and resilient condition. The NPS must specify the objectives desired from these forested systems and then begin managing these stands to produce and maintain the desired stand structure required to accomplish the chosen objectives.

Many of the forested stands on the Appomattox Court House National Historical Park currently are going through a successional transition. Natural mortality, disease, insect

infestations, and fire are threatening the vitality and integrity of the landscape resource of the park and are altering the aesthetic and cultural aspects of the the park.

This forest management plan has identified specific forest management objectives for the park and has made specific recommendations for achieving these objectives. The most important objective is to create a healthy and vigorous forested buffer along the perimeter of the park. The management plan also contains present stand condition descriptions for each of the 11 forest stand types found in the park. These stand types are further broken into management units, or compartments. A description, management objectives and recommendations, as well as a statement of projected future stand condition, are given for each of the 48 compartments.

It must be understood that this forest management plan represents a new direction and requires personnel expertise and resources that are not adequately provided for under the present NPS administrative structure. Implementation of the plan will require professional forestry decision making and management expertise. The plan may also require a technical forestry capability to actually accomplish the management tasks, should the Park Service choose to accomplish the prescribed work as an "in-house" function. Given the relatively small land areas involved at most historical sites, it is conceivable that the required personnel and other resources could be organized and administered as a multi-site team.

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## ACKNOWLEDGEMENTS

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## INTRODUCTION

National Park Service policy in historic zones has focused on preserving man-made and natural landscapes which project a desired image reflecting a historical event or depicting an era specific for that particular park (USDI, 1968). Often this has meant that forest and associated non-forested landscape resources at these parks were managed as natural non-manipulated ecosystems. With the passing of time, the forested landscapes have progressed successionally to the point where they are approaching or have already passed into the next seral stage, which may be quite different from the previous stage. In conjunction with these successional transitions, actual or potential disturbances such as natural mortality, disease, insect infestations and fire may become serious management problems. As a result, the aesthetic and cultural aspects of the forested landscape may be altered to the point where the historical event or era is no longer reflected, or park resource management objectives are no longer met. Thus, it is imperative that the forest management objectives for a particular park be clearly identified and that silvicultural

strategies be implemented to ensure that the desired forested landscapes are maintained in a vigorous and resilient condition.

Three forest management objectives have been identified for the Appomattox Court House National Historical Park.

1. To create a forested buffer around the Park's perimeter that will serve as a visual screen to protect the visitor's experience from being affected by contemporary land uses outside park boundaries.
2. To maintain this forested buffer in a healthy and vigorous condition so as to provide for the most effective screening.
3. To retain the Park in a land-use pattern typical of the Civil War period by maintaining an appropriate blend of woodlands and croplands.

These objectives will be achieved using three general methods. The first method will be to artificially and/or naturally regenerate those areas along the Park's perimeter which are presently non-forested. This will create a completely forested buffer around the perimeter to serve as a visual screen. The second method will be to prevent further deterioration of those stands which are regenerated following the wind and ice damage of the overmature Virginia pine<sup>1</sup> located throughout forested stands found in the Park. The third method will be to minimize the potential for extensive damage within the forested buffer around the

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<sup>1</sup> A listing of the common names and scientific names for all trees mentioned in the text is displayed in Appendix A.

Park's perimeter due to insect, disease, and fire outbreaks.

The purpose of this management plan is to delineate appropriate silvicultural prescriptions to meet the above-stated management objectives.

### Area Description

#### The Park

The Appomattox Court House National Historical Park is located in the southwestern portion of the Piedmont Plateau Physiographic Province of central Virginia (Figure 1). Aside from the historic park village, there are two major land uses within this 1320 acre park; approximately 735 acres are managed as woodlands and 438 acres as croplands which are leased to local farmers to be used for agricultural crops and grazing.

The Park is composed of gently rolling hills dissected by the Appomattox River and several perennial streams. Elevations within the Park range from a high of 830 feet near Grant's headquarters to a low of 645 feet along the Appomattox River (Figure 2). Slopes greater than 30 percent are common, but are usually found on the wooded areas of the Park. Croplands are generally confined to the gently sloping portions of the Park.

# PHYSIOGRAPHIC AND SOIL PARENT MATERIAL MAP OF VIRGINIA

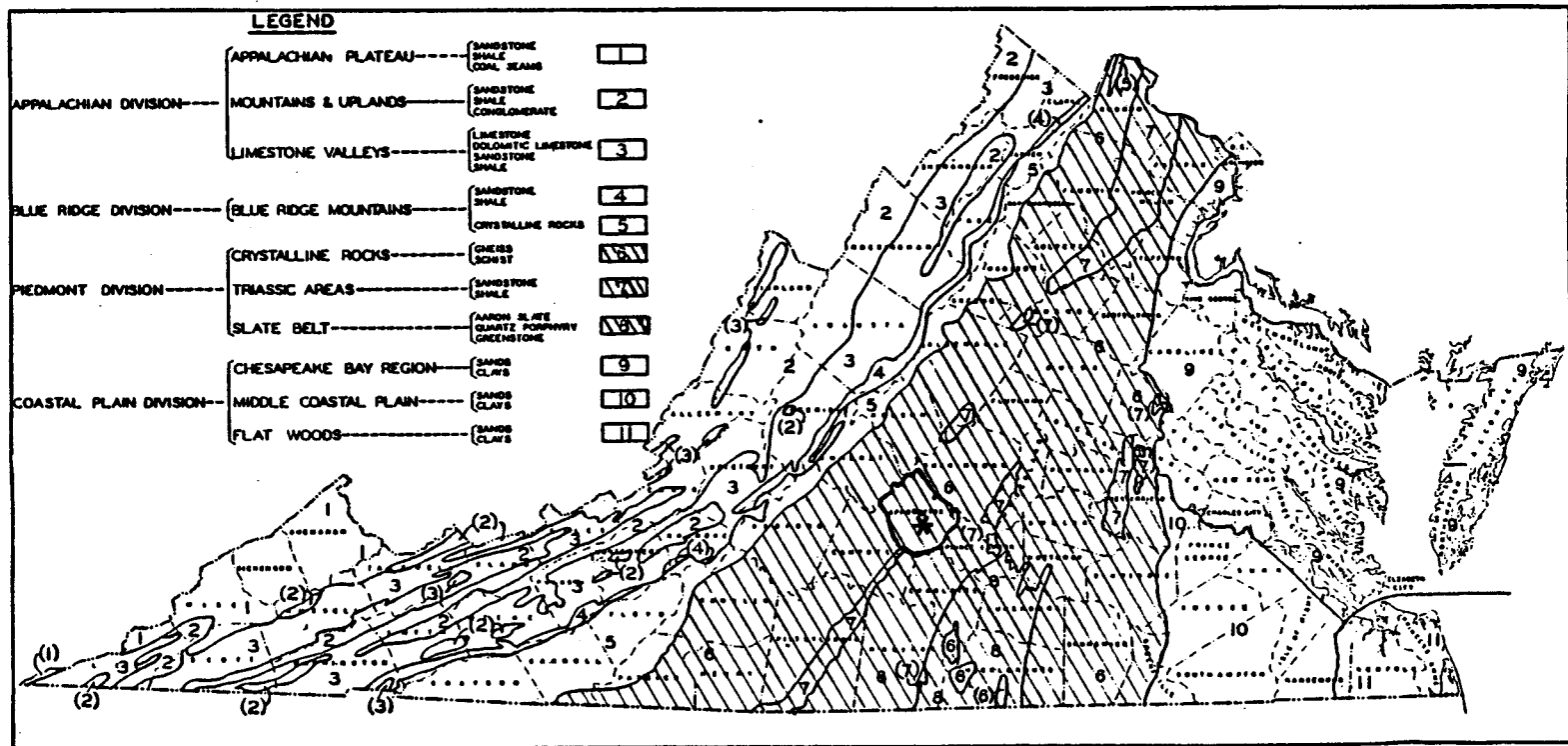


Figure 1. Location of the Appomattox Court House National Historical Park (\*) in the Piedmont Plateau Physiographic Region (Lietzke, 1979).

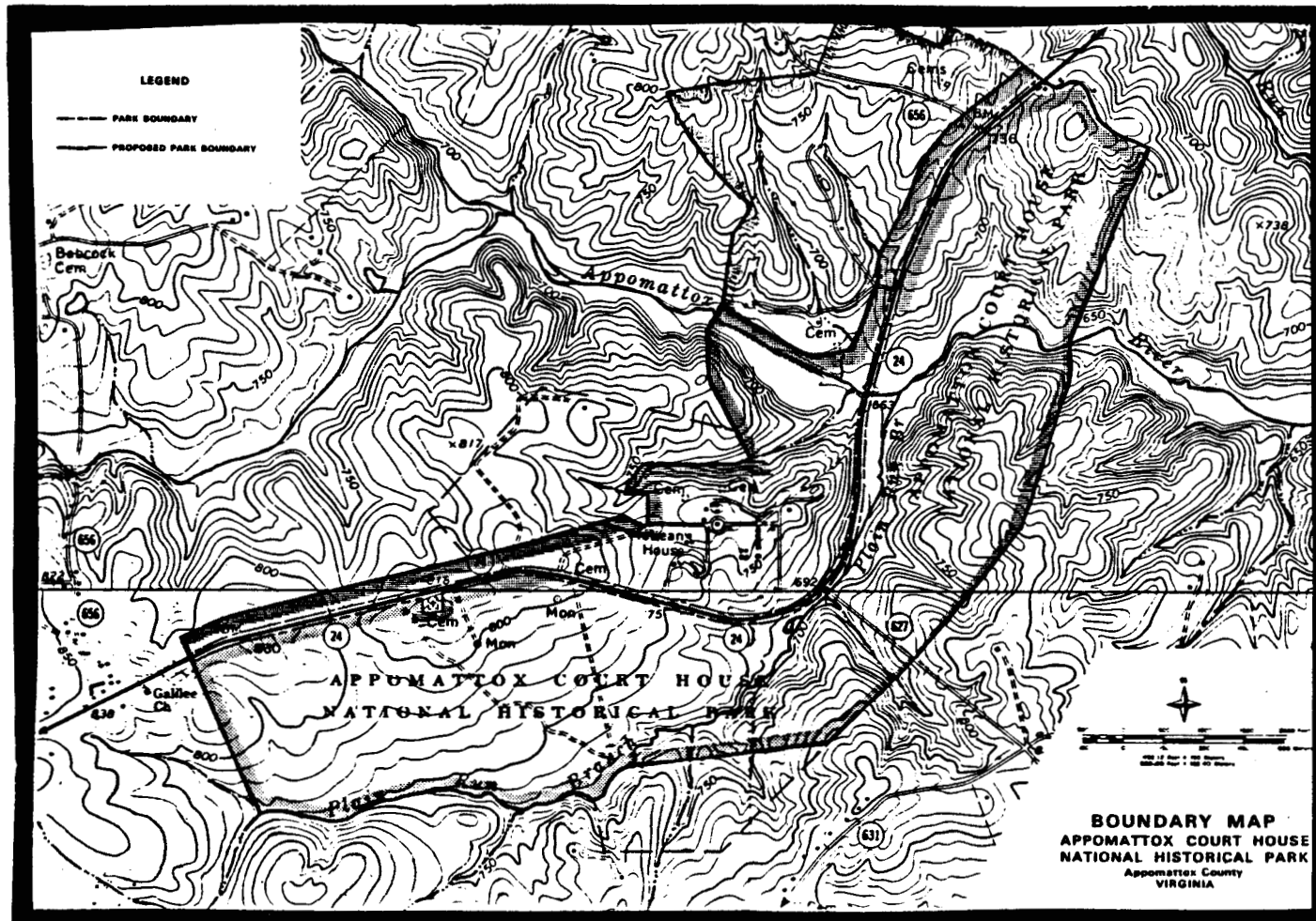


Figure 2. Topographic map for the Appomattox Court House National Historical Park, Appomattox, Virginia (USDI, 1976).

## Soils

A soil survey was prepared for the Park in 1976 by the Soil Conservation Service (Figure 3). (Appendix B contains the soils map, its key, and several tables which aid in the interpretation of the map.) Land purchases since 1976 have not yet been surveyed. Thus, the complete soil survey for these newly acquired acres is a priority management goal.

There are generally two basic types of soils found on the forested areas of the Park (Figure 3). These are the residual, upland soils and the alluvial, floodplain soils. The most typical residual, upland soils are the Cullen and the Iredell loam series. There are also the Enon and the Poindexter fine sandy loams and the Tatum and the Georgeville silt loams, but these four series occur much less frequently than do the Cullen and the Iredell series.

The Cullen loam soil series represents a deep, gently sloping, well-drained soil which has minimal limitations for woodland suitability and is one of the better soil series on the Park in terms of timber production. The Iredell loam series, however, is only moderately well-drained because it has a dense, clayey subsoil. Therefore, the Iredell loam is not only less productive than the Cullen loam, but the Iredell also has equipment-use restrictions. The Enon fine sandy loam series is deep and moderately well-drained, but

# LEGEND

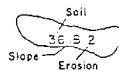
Figure 3. The soils map for the Appomattox Court House National Historical Park, Appomattox, Virginia.

--- PARK BOUNDARY     and  STATE ROAD

## ORDER OF SYMBOLS

## SLOPE PHASES

## EROSION PHASES



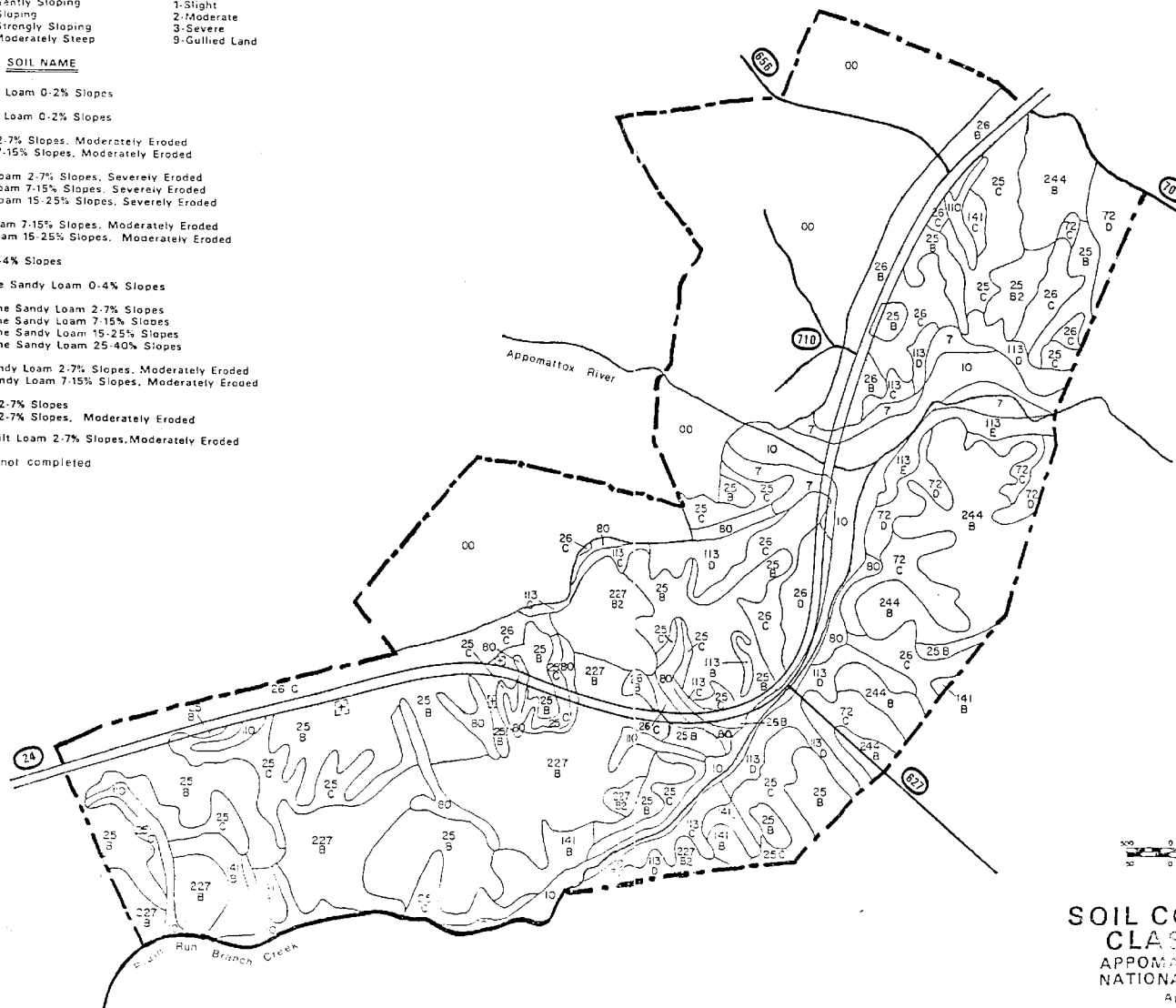
A-Nearly Level  
B-Gently Sloping  
C-Sloping  
D-Strongly Sloping  
E-Moderately Steep

+Overwash  
1-Slight  
2-Moderate  
3-Severe  
9-Gullied Land

## MAP SYMBOL

## SOIL NAME

7	Chewacla Silt Loam 0-2% Slopes
10	Congaree Silt Loam 0-2% Slopes
25B	Cullen Loam 2-7% Slopes, Moderately Eroded
25C	Cullen Loam 7-15% Slopes, Moderately Eroded
26B	Cullen Clay Loam 2-7% Slopes, Severely Eroded
26C	Cullen Clay Loam 7-15% Slopes, Severely Eroded
26D	Cullen Clay Loam 15-25% Slopes, Severely Eroded
72C	Tatum Silt Loam 7-15% Slopes, Moderately Eroded
72D	Tatum Silt Loam 15-25% Slopes, Moderately Eroded
80	Starr Loam 0-4% Slopes
110	Worsham Fine Sandy Loam 0-4% Slopes
113B	Poindexter Fine Sandy Loam 2-7% Slopes
113C	Poindexter Fine Sandy Loam 7-15% Slopes
113D	Poindexter Fine Sandy Loam 15-25% Slopes
113E	Poindexter Fine Sandy Loam 25-40% Slopes
141B	Enon Fine Sandy Loam 2-7% Slopes, Moderately Eroded
141C	Enon Fine Sandy Loam 7-15% Slopes, Moderately Eroded
227B	Iredell Loam 2-7% Slopes
227B2	Iredell Loam 2-7% Slopes, Moderately Eroded
244B	Georgeville Silt Loam 2-7% Slopes, Moderately Eroded
00	Soil survey not completed



SOIL CONDITION AND  
CLASSIFICATION  
APPOMATTOX COURT HOUSE  
NATIONAL HISTORICAL PARK  
Appomattox County  
VIRGINIA

has a dense, clayey subsoil. It too is only moderately productive in relation to other soils typical of the Park. The Poindexter fine sandy loam series is also only moderately productive. It is a shallow to moderately deep and droughty soil that is typically found along steep gradients. The Tatum silt loam and the Georgeville silt loam series are both deep, gently sloping to sloping, well-drained soils. The Georgeville series does not require any special management practices; however, the Tatum, because of its relatively steep slopes, requires careful forest management activities to assure minimal damage to the site.

These six soils series are quite frequently intermixed, especially the Cullen and the Iredell series. Therefore, it is advisable to keep all forest management activities within the Park confined to the driest months of the year because the clayey subsoil of the Iredell loam can often impede water drainage, thereby creating significant access problems during the wetter months.

The most typical alluvial, floodplain soils are the Starr loam, the Congaree silt loam, the Chewacla silt loam and the Worsham fine sandy loam series. The Starr loam and the Congaree silt loam are both deep, nearly level, well-drained alluvial soils. However, the Chewacla silt loam and the Worsham fine sandy loam are both poorly drained, and are



therefore prone to ponding. Very few forest management activities will ever take place on these soil series because of their location along stream courses in the Park. Buffer strips will be left along all streams within the Park to protect water quality.

### Climate

The climate in the region is affected by the mountains to the west and the Chesapeake Bay to the east; the result is relatively mild winters and humid summers. The mean annual temperature for Appomattox is 57 degrees Fahrenheit. Summer temperatures range from 39 to 102 degrees Fahrenheit. The winter extremes range from -11 to 81 degrees Fahrenheit. The growing season lasts approximately 168 days from April 29 to October 14. The mean annual precipitation, which is 41 inches, is well distributed throughout the year with a minimum in August and a maximum in October (Crockett, 1972).

### Succession

During the early 1800s, much of the land in the southeastern United States was used extensively for agriculture (Spurr and Barnes, 1980). However, most of this land was severely degraded by the late 1800s because of poor farming practices on the already low fertility soils typical

of the Piedmont (Burger and Kluender, 1982). Therefore, with the industrialization of the Northeast and the opening of the farmlands in the Midwest, much of the Southeast's exhausted agricultural land was abandoned. Through vegetational succession, these abandoned farmlands converted to woodlands over many years (Spurr and Barnes, 1980).

In old-field succession of the Southeast, abandoned farmlands are rapidly overtaken by Virginia pine and eastern redcedar. The initial invasion of the pine and cedar usually occurs within 3 to 5 years after land abandonment (Godfrey, 1980). These two species are very intolerant of shade, and therefore need full sunlight and exposed mineral soil for successful seed germination and seedling survival (USDA, 1965). Virginia pine, which seeds in much more rapidly than eastern redcedar, generally forms very dense and relatively pure stands within 10 to 15 years. In these stands, the pines grow tall but slender due to the high numbers and close spacing; therefore, they are very susceptible to wind and ice damage as they mature (Spurr and Barnes, 1980).

Once crown closure occurs within the stand, the pine seedlings can no longer reproduce on the forest floor due to insufficient light (Bramlett and Kitchens, 1983). Only those hardwood species which are shade tolerant can

reproduce beneath the pine canopy. Therefore, within 20 to 40 years after the pine forest is established, a distinct two-level forest develops with a pine overstory and a low, hardwood understory.

As the pine overstory matures and suffers wind and ice damage, the residual understory hardwoods speed their development. The Virginia pine decline and subsequent blowdown is fairly rapid. It generally begins once the stand reaches 50 to 60 years of age, and it usually takes no more than 10 to 12 years for the entire stand to come down. As the pines blow down, the hardwood residuals in the understory are subject to breakage which may permanently alter their form and growth. However, shade intolerant hardwoods quickly respond to the openings in the stand created by the pine mortality (Bramlett and Kitchens, 1983).

The overall condition of the stand is poor during this transitional period. First of all, there is an increased incidence of disease and insect infestation due to the reduced vigor of the stressed pines. In turn, this encourages root rot outbreaks which are often followed by bark beetle attacks (Jacobi et al., 1981). Secondly, the risk of associated wildfires is extremely high because of the large amount of fuel in the form of snags (standing dead trees) and downed trees (Brown and Davis, 1973).

Once this transitional stage is completed, the result is a relatively short-lived mixed hardwood-pine forest type which begins shifting, within 40 to 50 years, towards the climax forest cover type<sup>2</sup> for the region (Godfrey, 1980). In the Piedmont region of central Virginia, the climax forest type is usually oak-hickory; however, beech will be the climax hardwood forest type wherever it is present.

It is important to note that the mixed oak-hickory climax forest type may soon face the threat of partial or complete defoliation by the gypsy moth. At this time, the gypsy moth is only three counties north of the Park, and it is expected to become a serious forest management problem within the next 5 to 10 years. (For more specific information about the gypsy moth and the threat it poses, please refer to Appendix C.)

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<sup>2</sup> The climax forest represents a relatively stable, long-lived cover type which ends the successional process in a community (Whittaker, 1970). There will continue to be subtle change in the species composition of the climax forest because the forest environment is a dynamic (ever-changing) system. Catastrophic events, such as wildfires, periodically cause major shifts in the successional state of the forest.

## FOREST INVENTORY

This section contains a description of the methods and procedures used to inventory the stands in the Appomattox Court House National Historical Park. A reconnaissance cruise was made prior to the actual inventory to evaluate the overall forest conditions. During this reconnaissance cruise, aerial photographs were used to help delineate the forest cover types. Four general cover types were identified based on overstory species composition: upland hardwood, bottomland hardwood, mixed hardwood-pine, and pine. Each of these forest cover types was then divided into its respective stand types based on species composition, stand condition and/or age. The area for each stand type was determined from the aerial photographs. And finally, each of the eleven stand types identified within the Park was broken into compartments<sup>3</sup> (Table 1) and (Figure 4).

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<sup>3</sup> A compartment is a management unit in which a single management prescription will be implemented.

Table 1. Stand type and acreage summary for all compartments located on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Compartment	Stand Type	Acreage
1	Pine (11- to 30-year-old)	3
2	Pine (31- to 50-year-old)	3
3	Pine (50+ year old)	8
4	Bottomland hardwood	31
5	Pine (50+ year old)	13
6	Grazed Virginia pine-Upland hardwood	5
7	Virginia pine-Upland hardwood	4
8	Virginia pine-Upland hardwood	7
9	Pine (50+ year old)	8
10	Pine (50+ year old)	8
11	Pine (31- to 50-year-old)	5
12	Pine (50+ year old)	47
13	Pine (1- to 10-year-old)	5
14	White oak-Black oak	16
15	Virginia pine-Upland hardwood	17
16	White oak-Black oak	13
17	Bottomland hardwood	22
18	Grazed Red maple-Mixed hardwood	9
19	Pine (50+ year old)	3
20	Pine (31- to 50-year-old)	11
21	Pine (50+ year old)	3
22	Pine (50+ year old)	6
23	White oak-Chestnut oak-Black oak	23
24	Pine (50+ year old)	8
25	Virginia pine-Upland hardwood	14
26	Pine (50+ year old)	5
27	Bottomland hardwood	54
28	Pine (50+ year old)	27
29	Pine (50+ year old)	28
30	White oak-Black oak	72
31	Virginia pine-Upland hardwood	17
32	Pine (31- to 50-year-old)	16
33	White oak-Chestnut oak-Black oak	36
34	Pine (1- to 10-year-old)	3
35	Pine (1- to 10-year-old)	4
36	Young Mixed Conifer-Hardwood	13
37	Grazed Red maple-Mixed hardwood	14
38	Pine (11- to 30-year-old)	13
39	Young Mixed Conifer-Hardwood	10
40	Bottomland hardwood	19
41	White oak-Black oak	7
42	Pine (31- to 50-year-old)	14
43	White oak-Black oak	3
44	Pine (31- to 50-year-old)	35
45	Pine (31- to 50-year-old)	9
46	Young Mixed Conifer-Hardwood	4
47	White oak-Chestnut oak-Black oak	19
48	Young Mixed Conifer-Hardwood	21

Total = 735

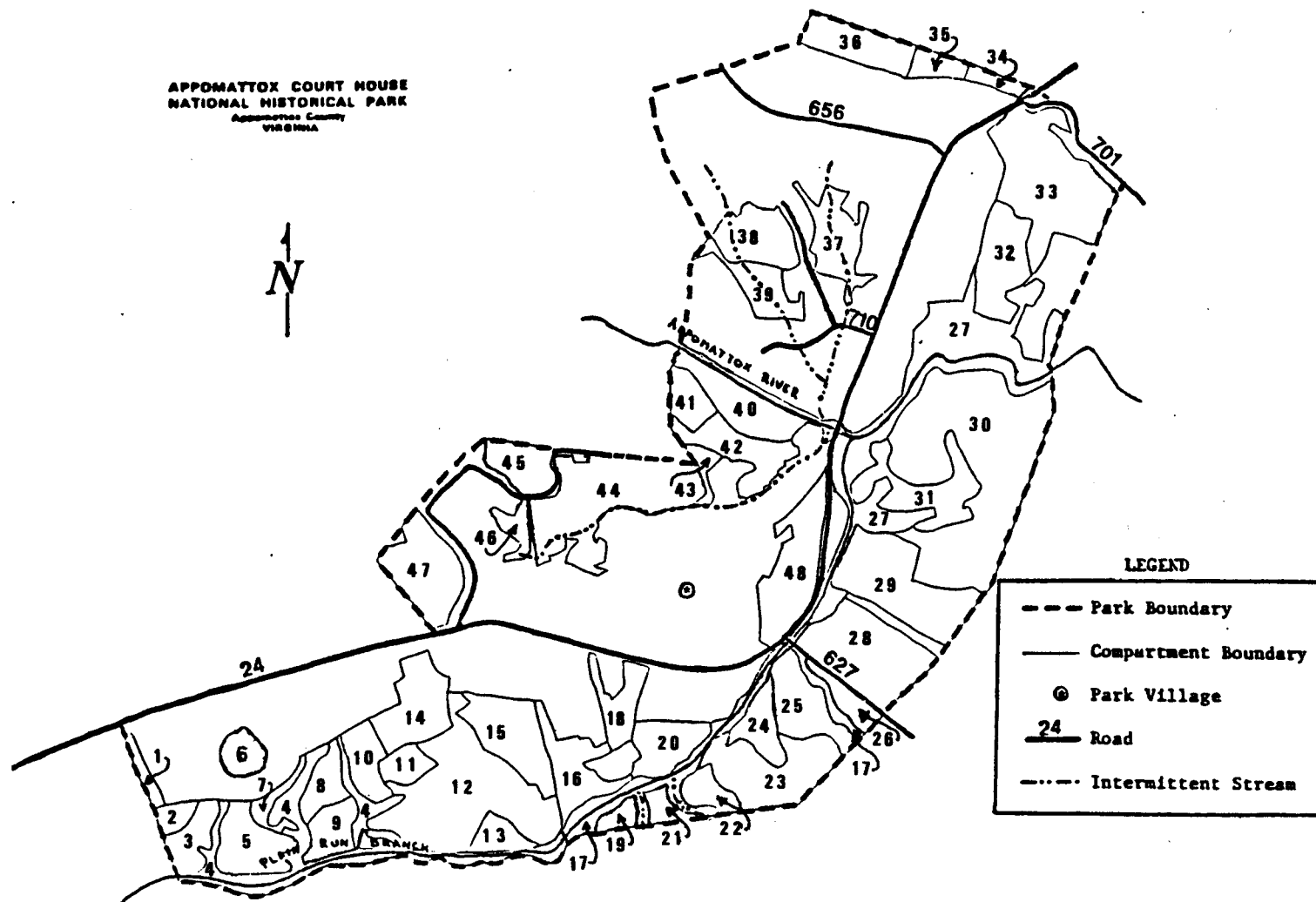


Figure 4: Compartment map for the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Strata Delineation

All stand types were inventoried during July, 1984. These inventories included samples representing three vertical, vegetative strata in the forest: overstory, midstory, and regeneration.

Sample plots were randomly located within each stand type to ensure an unbiased representation of stand characteristics. The first measurement, the overstory inventory, was taken at sample plot center. Secondly, four midstory inventories were taken, each lying in one of four quadrants approximately 50 to 500 feet from the plot center, depending upon arrangement and size of the stand. Lastly, four regeneration inventories were taken for each midstory inventory. These regeneration inventories were also located in quadrants; however, this time each midstory sample plot acted as plot center. Each regeneration inventory was approximately 10 to 50 feet from its respective midstory plot center. (Appendix D contains an example of the type of data sheet used in the inventory of forested stands in the Park.)

A more detailed version of the sampling techniques used for each vegetation level is described in the following paragraphs.



Overstory. A prism with basal area factor<sup>4</sup> 10 was used to determine the total stand basal area of the overstory<sup>5</sup> component. The total basal area was then broken down into percent of the total basal area by species. There were 45 basal area samples taken across all types. At each of these locations a general stand description was written to assist in characterizing the overall stand condition. Information included such things as general tree condition, evidence of insect and/or disease, signs of wildlife, and any unique (aesthetic) features or need for cultural treatment.

Midstory. Plots of 1/100-acre size were used to sample the type, size, and frequency of individual species occurring in the midstory.<sup>6</sup> In these midstory samples, all trees greater than or equal to 1-inch diameter breast height (dbh) but less than or equal to 5-inch dbh were tallied. For every basal area sample taken, four midstory samples were taken for a total of 180 midstory plots.

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<sup>4</sup> A basal area factor of 10 represents 10 square feet of basal area per acre for every tree tallied. Basal area is an expression of stand density based on the number and size of trees occurring in the main canopy, and/or a measure of stem cross-sectional area for all stems, at 4.5 feet above the ground, in square feet per acre.

<sup>5</sup> The overstory is composed of those trees which make up the main canopy of the forest.

<sup>6</sup> The midstory is composed of those trees which generally comprise secondary and tertiary canopies beneath the main canopy.

Regeneration. A 1/1000-acre plot was used to sample the regeneration.<sup>7</sup> Species type and frequency were recorded for each plot (only those individuals which were less than 1-inch dbh were sampled). Four regeneration plots were sampled for every one midstory sample plot for a total of 720 regeneration plots.

#### Site Productivity

Increment cores were taken from several dominant, overstory trees within a stand to determine average stand age and some qualitative information on present and past growth rates. A dominant tree is a vigorous individual (one which is not stagnated or suppressed) which receives ample amounts of sunlight on all sides; this type of individual gives an indication of maximum tree growth obtainable on a site. Total tree heights were measured from these dominant individuals using a clinometer. This information (tree age and height) was later used to determine an estimate of the site quality index for each sampled area.

A soils map had been prepared for the Park by the Soil Conservation Service in 1976 (Figure 3 and Appendix B) This map was used to supplement data gathered during the

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<sup>7</sup> The regeneration strata is composed of relatively small individuals which are typically less than four feet in height.

inventory, and it aided in the evaluation of site quality, species suitability and stand accessibility. (Appendix B contains the soils map, its key, and several tables which aid in the interpretation of the map.)

## FOREST MANAGEMENT

Present stand condition descriptions are presented for each stand type based on the sampling data collected during the inventory and subsequent on-site visits. Each stand type has been divided into compartments. In most instances, each compartment is described individually, and a management objective and recommendation as well as a discussion of the projected future stand conditions (stand conditions 50 years after implementation of the management recommendation) are given.

The management objective for each compartment was provided by the Park Superintendent. In most cases, each compartment is managed as either a visual screen or a forested buffer.<sup>8</sup> A visual screen is a planted tree zone managed specifically to block the view of land uses outside the Park boundary which might adversely affect the visitor's experience. A forested buffer, on the otherhand, is a naturally regenerated stand which is desired to provide solitude for the Park; it separates the Park from its

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<sup>8</sup> In some instances, a particular compartment might need to be managed to help create a land-use pattern in the Park which is typical of the Civil War period.

surrounding present day environment.

### Silvicultural Alternatives

The majority of the forested stands within the project area are in rapid transition from an early successional stage (pioneer stage) to an intermediate successional stage. In most instances, the recommended silvicultural procedure to be implemented in these stands would be some form of an improvement (intermediate) cut, either a salvage cut or a sanitation cut. An improvement cut is made for the purpose of improving the composition and quality of the stand by removing trees of undesirable species, form or condition from the canopy (Smith, 1962). The salvage cut is necessary to remove damaged or dead trees from the stand in hopes of reducing the threat of further loss from fire, insects and/or disease. On the otherhand, the sanitation cut is necessary when stands are in an advanced stage of decline such that the value of the material taken out of the stand will not pay for the expense of the operation (Smith, 1962). Both the salvage and the sanitation cuts could be quite heavy depending on the present stand condition. However, in almost all cases, there is sufficient understory vegetation present to provide for fully stocked future stands.

In most cases, the younger stands on the Park that have evolved from old fields are of an even-aged nature; however, as natural succession proceeds, there is a tendency to move towards uneven-aged stands with more ages present, depending on species composition and the type and extent of disturbance that occurs over time. This natural progression can be enhanced by the periodic removal of overmature or declining individual trees so that new individuals will be introduced into the openings and a multi-layered, vigorous and healthy stand can be developed and maintained.

Stand Type A: Pine (1- to 10-years-old)

Stand Type A represents the pine stands which are less than 10 years old (Table 2). This stand type covers a total of 12 acres on the Park and is divided into three compartments (Compartments 13, 34 and 35).

Compartment 13

Description and Location.

Compartment 13 is a 5-acre tract located along the present history/nature trail (Figure 5). Following the harvest of the overmature Virginia pine in 1983, the area was bulldozed and planted with loblolly pine at a rate of 800 trees per acre in January, 1984. Pine survival is

Table 2. Summary of stand characteristics for the Pine Stand Type (1- to 10-year-old) on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Compartment	Area (acres)	Stand Age (years)	Stand Density (trees/acre)
13	5	1-2	600
34	3	6-7	700
35	4	3-4	700

estimated to be 75 percent or 600 trees per acre (inventory taken in May, 1985) and is good despite the severe hardwood competition. The major hardwood competitors in the stand include red maple, hickory species, yellow-poplar, and dogwood. These species will outcompete many of the planted pines, thereby producing a mixed hardwood-pine stand within 10 to 15 years.

The compartment is located on gently sloping Enon fine sandy loam which is typically found on upland Piedmont landscapes. Its clayey subsoil necessitates that all forest management practices be carried out during dry periods of the year.

#### Management Objective.

Compartment 13 will help create a forested buffer along the Park's perimeter. However, it is not necessary that this compartment be managed as a pure pine stand. A mixed pine-hardwood stand is the preferred stand composition.

#### Management Recommendation.

Given sufficient time without any disturbance (such as wildfire), the hardwoods should begin to outcompete many of the remaining loblolly pines, thereby creating a stand of mixed species composition (hardwood and pine). The mixed hardwood-pine composition, which is more typical of this area, is much preferred to the pure pine species composition



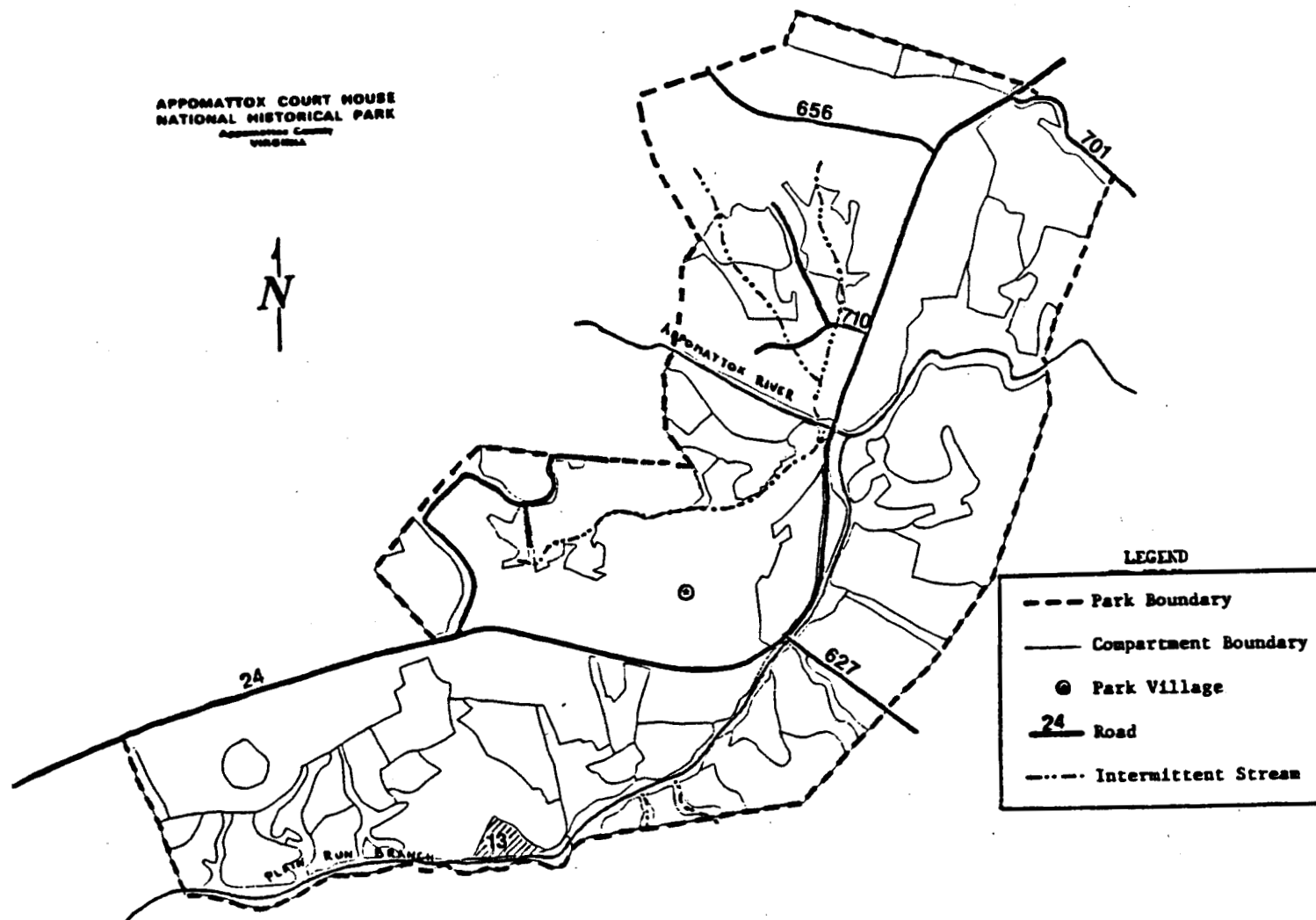


Figure 5: Location of Compartment 13 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

because it will be relatively easy to manage. Thus, the compartment should be left as it is, except to remove any damaged or diseased trees which might pose a threat to the vigor of the remaining stand. However, should the total basal area of the stand exceed 120-140 square feet per acre and/or the stand show significant signs of decline and reduced vigor, a thinning or improvement cut may be appropriate. This would favor healthy and vigorous trees (pine or hardwood) and result in good stem distribution. The density condition is most likely to occur before the stand is 25 to 30 years of age and mean dbh is 6 to 8 inches. The purpose of reducing the basal area would be to improve the individual tree vigor of the trees left following the intermediate cut. The residual basal area following the cut should not be less than 65 to 75 square feet per acre and under no circumstances should more than 40 to 45% of the total basal area be cut.

#### Future Stand Conditions.

The pine will probably start to decline at 60 to 80 years of age; however, because of previous management, the loss of pine will gradually lead to the succession of hardwoods, and will therefore not result in any severe management problems.

Compartment 34Description and Location.

Compartment 34 is a 3-acre, 6- to 7-year-old loblolly pine visual screen that was planted along the northern boundary of the Park in 1978 (Figure 6). This screen is bordered on its northern edge by land recently purchased by a private timber company. On its southeastern edge, the screen is bordered by open fields which are leased by the Park to be used for agricultural crops. Access to this compartment and to neighboring Compartment 35 is good because of the location of these open fields.

Survival is very high in this planted screen, with an average of 95% of the original 800 pine trees per acre surviving. The average height of the pine in this screen is approximately 10 feet. The average spacing between individuals is about 7 feet by 8 feet. The live crown length of these pines extends almost to the ground, but the branches of neighboring pines have just begun to touch. So, a thinning to remove every other tree was recommended and performed in July, 1985 to encourage greater live crown lengths on the remaining pines in the years to come.

At present, the screen is approximately 150 feet wide and contains 15 rows of loblolly pine trees. A few scattered hardwood individuals are located within the stand; however,

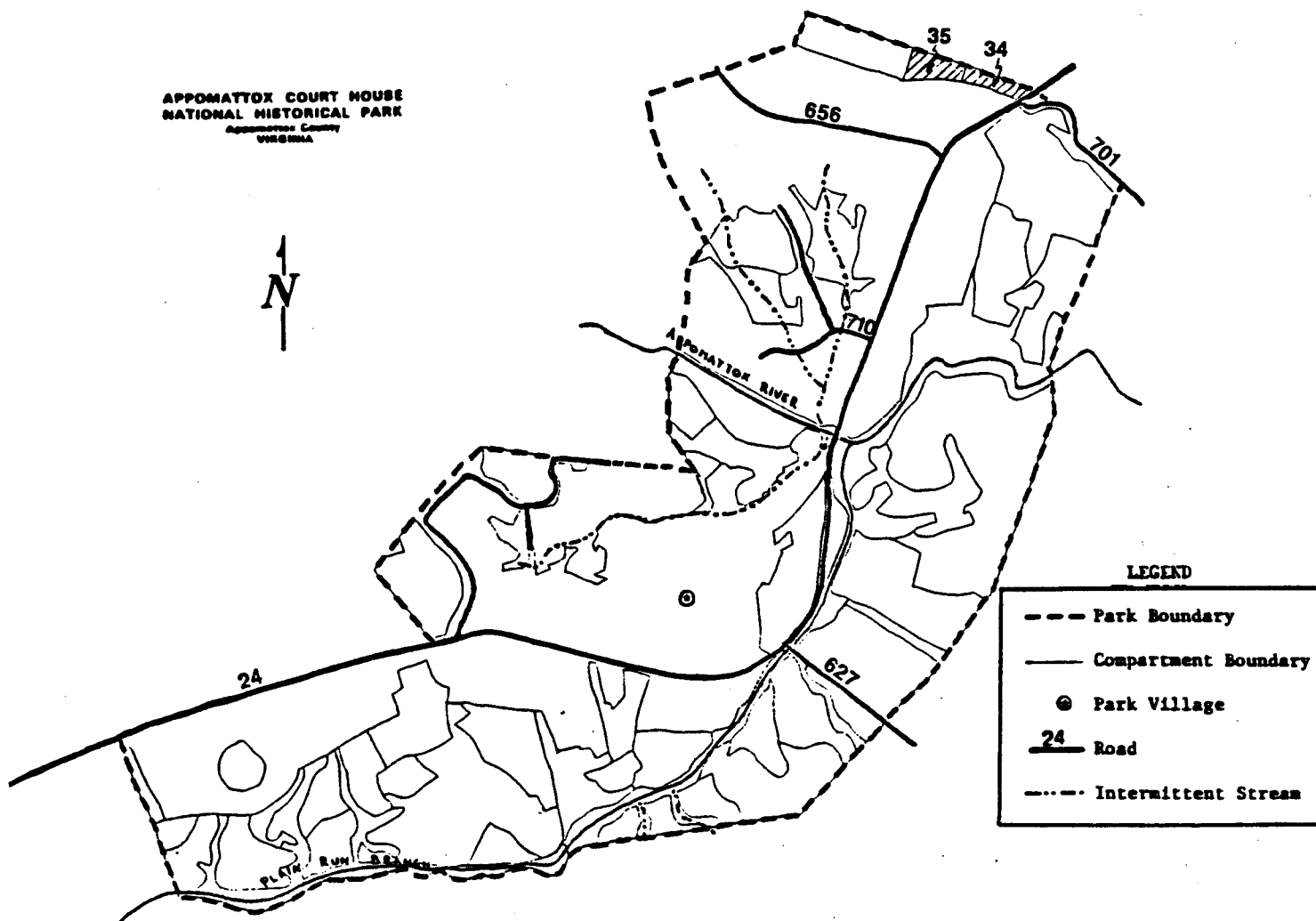


Figure 6: Location of Compartments 34 and 35 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

they currently comprise less than 5 percent of the total stand. These hardwoods are mostly mixed oak species, and black locust.

The soils data for this portion of the Park have not yet been assimilated because this area was purchased after the soils map was prepared for the Park in 1976; however, the soils appear to be similar to adjacent types and pose no significant management problems.

Management Objective.

Compartment 34 will be used as a visual screen to hide from view those land uses outside the Park boundaries which might adversely affect the park visitor's experience. This visual screen will initially be managed to maintain the compartment as a pure pine stand to provide year-round screening. However, as a series of vertical strata develop over time, this screen will be managed to produce a mixed pine-hardwood stand. The present width of the screen necessitates that there always be a significant (greater than 60%) evergreen component present in this compartment to provide year-round screening.

Management Recommendation.

Every other tree was removed in July, 1985, to promote greater live crown length on the pines in the future. This thinning was recommended based on the present stand

conditions of the compartment where branches of neighboring pines were just beginning to touch. As the branches of neighboring trees begin to touch once again, in about 5 to 8 years, a second thinning should be implemented to remove every other tree. About 8 to 10 years after this second thinning, the compartment should be thinned again, and should also be evaluated to determine if adequate evergreen regeneration is becoming established. If not, some evergreen species (Virginia pine, loblolly pine, and/or eastern redcedar) must be planted and maintained to assure that the screen provides year-round effectiveness. The compartment should be evaluated every 10 years thereafter to determine when subsequent thinnings are necessary.

The final harvesting of this compartment should be done in two phases, beginning 45 to 50 years from now. The first phase would require removing one-half of the present screen, parallel to the boundary, and replanting with coniferous species. After the replanted part has developed into a functional screen (15 to 20 years), then the other half would be removed and replanted.

#### Future Stand Conditions.

Fifty years from now, this compartment will consist of a two-aged stand. One-half of the compartment will have been recently harvested and will be approximately 1 to 5 years

old, whereas the remaining half will be about 55 to 58 years old (and will not be harvested for another 13 to 18 years). The stand will be composed predominantly of pine with an increasing amount of hardwoods showing up over the years.

### Compartment 35

#### Description and Location.

Compartment 35 is also a loblolly pine visual screen. It is located adjacent to Compartment 34; however, these pines were planted in 1981 and are only 3- to 4-years-old (Figure 5). This screen is approximately 250 feet wide and averages 700 trees per acre with excellent survival. The average height of these pines is 7 to 8 feet; however, there is a wide variation in the height of individuals due to site quality variation within the compartment. In portions of this screen, the pines are no more than 4 to 5 feet tall, and the branches of neighboring pines have not yet begun to touch. However, in other parts of the screen, where the pines are at least 8 to 10 feet tall, branches of neighboring trees have begun to touch.

The soils data for this portion of the Park have not yet been collected because this area was purchased after the Soils map was prepared for the Park in 1976; however, the soils appear to be similar to adjacent types and pose no significant management problems.

Management Objective.

The management objective for this compartment, visual screening, is identical to the objective for Compartment 34. (See page 29.)

Management Recommendation.

This stand should be thinned within the next two years. Otherwise, the screening effectiveness of the larger trees will be reduced because their live crown length will decrease due to competition for light and space between neighboring trees. This thinning and all subsequent management activities should follow the same pattern as that outlined for Compartment 34 on pages 29 and 30.

Future Stand Conditions.

The recommended management activities for this compartment follow the same pattern as those suggested for Compartment 34; therefore, the future stand conditions for the two compartments will be quite similar. (See the Future Stand Conditions for Compartment 34 outlined on pages 30 and 31).



Stand Type B: Pine (11- to 30-years-old)

This stand type represents all of the pine stands which are between 11 and 30 years of age (totalling 16 acres). It is broken into two compartments (Compartments 1 and 38), each with a different pine species. Compartment 1 is a 13-year-old Virginia pine stand, and Compartment 38 is a 18-year-old loblolly pine stand (Table 3).

Compartment 1

Description and Location.

Compartment 1 is a visual screen located along the western boundary of the park (Figure 7). It is a 3-acre compartment composed mostly of planted Virginia pine with a small amount of natural, mixed hardwoods. Access to this compartment is good and is available from the adjacent fields.

Portions of this screen were naturally regenerated by the seed from adjacent pine and hardwood stands. However, the distribution of the natural regeneration was variable and did not create an adequate buffer. Therefore, in 1973, the remaining portions of the boundary were planted with Virginia pine on a 5 by 5 foot spacing. This Virginia pine is presently 12-years-old with an average tree height between 18 and 20 feet.

Table 3. Summary of the stand characteristics for the Pine (11- to 30-year-old) Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Compartment	Species (Pinus)	Stand Age (years)	Stand Density (trees/acre)	DBH <sup>1</sup> (inches)
1	Virginia	12-13	1740	2.4
38	loblolly	17-18	700	5.8

1. DBH stands for the average diameter at breast height measured in inches.

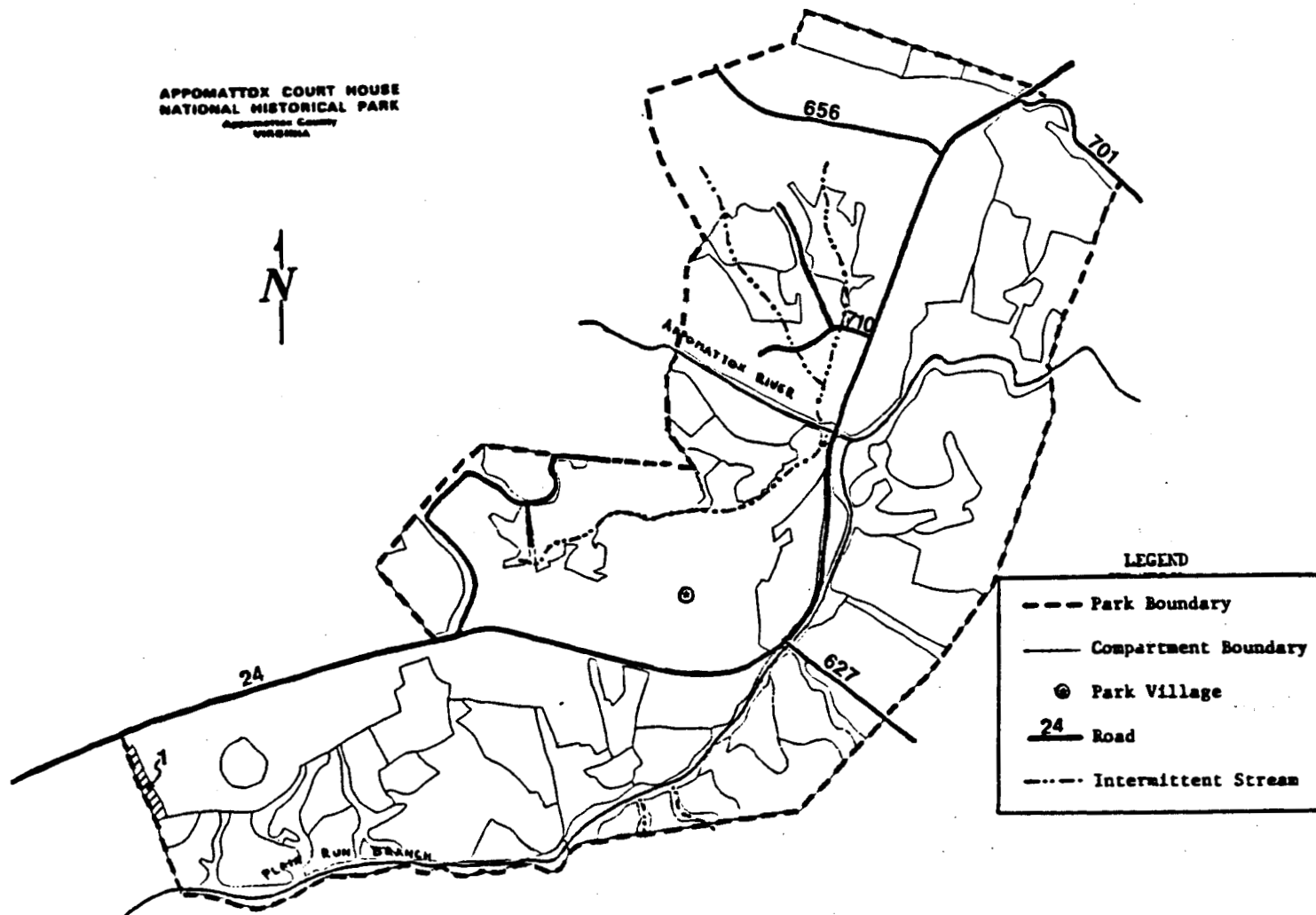


Figure 7: Location of Compartment 1 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

The vast majority of the screen consists of Virginia pine; however, other species are present. Some of the more common associates of Virginia pine found on the site are green ash, willow oak, white oak, black oak, post oak, dogwood, and eastern redcedar. These associated species make up less than 10% of the total screen and are relegated to the lower canopy position.

The screen is approximately 1000 feet long and a 100 feet wide; however, screen width varies from 40 to 100 feet. The average stand density and basal area are 1740 trees per acre and 84 square feet per acre, respectively. Overcrowding has led to decreased live crown length and spindly stems on trees located within the screen. Trees found in the exterior rows of the screen, where light is available, generally have live branches reaching the ground. Virginia pine is a very shade intolerant species and it is natural for its lower branches to die when light is restricted by crown closure. The very close spacing and high stem density in the visual screen has resulted in the entire stand being in a very unstable condition.

The majority of this Virginia pine screen occurs on Cullen loam, and therefore, poses no significant management problems.

Management Objective.

Compartment 1 will be used as a visual screen to hide from view those land uses outside the Park boundaries which might adversely affect the park visitor's experience. Initially, this stand will be managed to maintain an evergreen screen. However, once the fence is moved and the present screen width increased, the compartment will be managed to encourage hardwood species.

Management Recommendation.

After an analysis of the present stand condition, a thinning was recommended as the manipulation best suited for maintaining the integrity of the screen. It was noted that there was a high probability of blowdown or ice damage to the thinned stand because of both the extreme overcrowding in the stand and the spindly nature of individual stems. However, if the stand could survive ice and snow damage for two years following the thinning, the probability of remaining intact would be greatly improved.

In July, 1984, following this recommendation, approximately one-third of the visual screen width was thinned. Although the expected response of the Virginia pine to the thinning was good, the amount of damage that the stand sustained during a January (1985) ice storm made it necessary to seek an alternative management scheme that

would allow the present screen to remain intact until an additional screen could be created.

It is anticipated that the present screen will remain effective for no more than 5 to 10 years before major blowdown and ice damage will greatly reduce the screen's effectiveness and integrity. Therefore, to improve the quality of the visual screen, it is recommended that the present screen be widened. This will require that the fence which now separates the present visual screen from the adjacent pasture be relocated. We propose that this fence be moved in two stages, thereby creating three different age/structure classes within the visual screen. Each move should increase the screen width by 125 to 150 feet. This increased temporal and structural variation will make forest management within the screen much less visible.

Following the first relocation of the fence, a 45 foot border consisting of three rows (each containing a mixture of species) should be planted between the present screen and the adjacent pasture. Spacing for these rows can vary; however, the average spacing within and between rows should be between 15 to 25 feet. The suggested species to be planted in these rows should be eastern redcedar, Virginia pine, and flowering dogwood (or a suitable native alternative). (Appendix E contains the current price list

for Virginia Division of Forestry seedlings.) Approximately 4/5 of these rows should consist of an equal mixture of the pine and cedar; only 1/5 of the rows should be planted with flowering dogwood.

#### Rationale of Species Selection.

Eastern redcedar is a slow growing, shade intolerant, evergreen tree which maintains its conical shape while growing (USDA, 1965). It grows at a rate of 8 to 12 inches per year (Sharp, 1977). It is considered a small- to medium-sized tree usually reaching only 40 to 50 feet tall at maturity. Although some eastern redcedars begin bearing seeds by age 10, the best seedbearing age is between 25 and 75 years. During that time, good seed crops are produced every 2 to 3 years (USDA, 1965). Its relatively slow growth, resistance to insect and disease, sturdy nature and dense year-around foliage make it particularly desirable for a visual screen.

Virginia pine is also a medium-sized, evergreen tree. It is very shade intolerant, and is a pioneer species which is often the first species to invade a recently abandoned or disturbed site. In open-grown conditions, the Virginia pine can begin producing cones at 5 years of age. Good seed crops will usually occur every three or more years (USDA, 1965). When allowed to develop under open-grown conditions,

it has many characteristics desirable for visual screens, especially when grown in combination with other species.

Flowering dogwood is a medium-sized, deciduous tree. It grows on a variety of soils, and it is very shade tolerant. In early spring, the dogwood is typically covered with showy, white flowers (USDA, 1965). The combination of these white flowers against the evergreen foliage of the cedar and the pine will be extremely visually appealing.

#### Planting Procedures and Future Management of the Screen.

Planting of these species should begin in early spring as soon as the ground is no longer frozen. (Appendix F contains information about correct planting procedures for bare-rooted seedlings.) Late fall and early winter planting is not usually very successful because the planted seedlings are more susceptible to frost heaving and winter kill (Rafaill and Vogel, 1978).

Approximately 10 to 15 years after this border is planted, the fence should be moved out another increment. Virginia pine, eastern redcedar, flowering dogwood and other species should readily seed in once the fence is moved and mowing/grazing is stopped. Once the final move is completed (and the screen is approximately 400 feet wide), the oldest stand will be 30 or more years of age. The other stands will be staggered in age depending on when the fence was



moved each time. This variation will allow renovation or removal of a single age or structural group to take place without significantly disturbing the entire screen.

When renovation or removal is necessary within an age/structural class, the trees should all be removed at once in the late summer to make the best use of seed dispersal from the remaining trees. Seed dispersal from the Virginia pine, eastern redcedar and flowering dogwood usually begins in early fall (Dirr, 1983), and it should be sufficient to reseed the harvested site. Thereafter, as needed (perhaps at 10 to 20 year intervals), the next age/structural class in sequence should be renovated or removed.

#### Future Stand Conditions.

After 50 years, a minimum of three different age groups will be established in the visual screen. The oldest stand will have been harvested approximately 10 to 15 years earlier. Therefore, there will now be a stand of recently established regeneration in its place that is no older than 12 to 14 years. The remaining two age groups will be approximately 50 and 35 years old, respectively, the older of these two age groups will need to be harvested immediately.

Each of the different age groups will be predominantly Virginia pine because it is currently the most abundant species on the site, and it is a rapid invader of idle lands. However, there will be a significant component of eastern redcedar, flowering dogwood, and mixed hardwoods. The hardwood component will increase with time because the Virginia pine will not compete with the hardwoods unless a complete harvest (clearcut) with mineral soil exposure occurs. Hardwoods should be controlled so as not to make-up more than 30 to 40 percent of the total canopy.

### Compartment 38

#### Description and Location.

Compartment 38 is a 13-acre loblolly pine stand that is approximately 18-years-old. There are currently about 700 pine trees per acre in the stand. Average height of these trees is 40 feet; average diameter breast height is 5.8 inches. Spacing between trees within the stand averages 7 by 9 feet.

The stand is located along Route 710, just uphill of the Appomattox River on the northwestern side of the Park (Figure 8). This road provides easy access to the compartment. An intermittent stream, which feeds into the

Appomattox River,<sup>9</sup> flows through the middle of the stand. Therefore, any management activities in this compartment should be confined to the summer or other dry months so as not to disturb the stream.

The soils data for this compartment have not yet been collected because this portion of the Park was purchased after the soils map was prepared for the Park in 1976; however, the soils appear to be similar to adjacent types and pose no significant management problems.

Management Objective.

Compartment 38 will be used as a visual screen to hide from view those land uses outside the Park boundaries which might adversely affect the Park visitor's experience. This stand will initially be managed to maintain the loblolly pine screen. However, once these pines are harvested, it will no longer be necessary to manage this compartment as a pure pine stand. A mixed hardwood-pine stand with several vertical strata will serve as an equally effective screen. Therefore, subsequent stands will be naturally regenerated and will be composed of a pine-hardwood mixture.

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<sup>9</sup> Intermittent streams flow only during the wet season of the year (Hewlett, 1982).

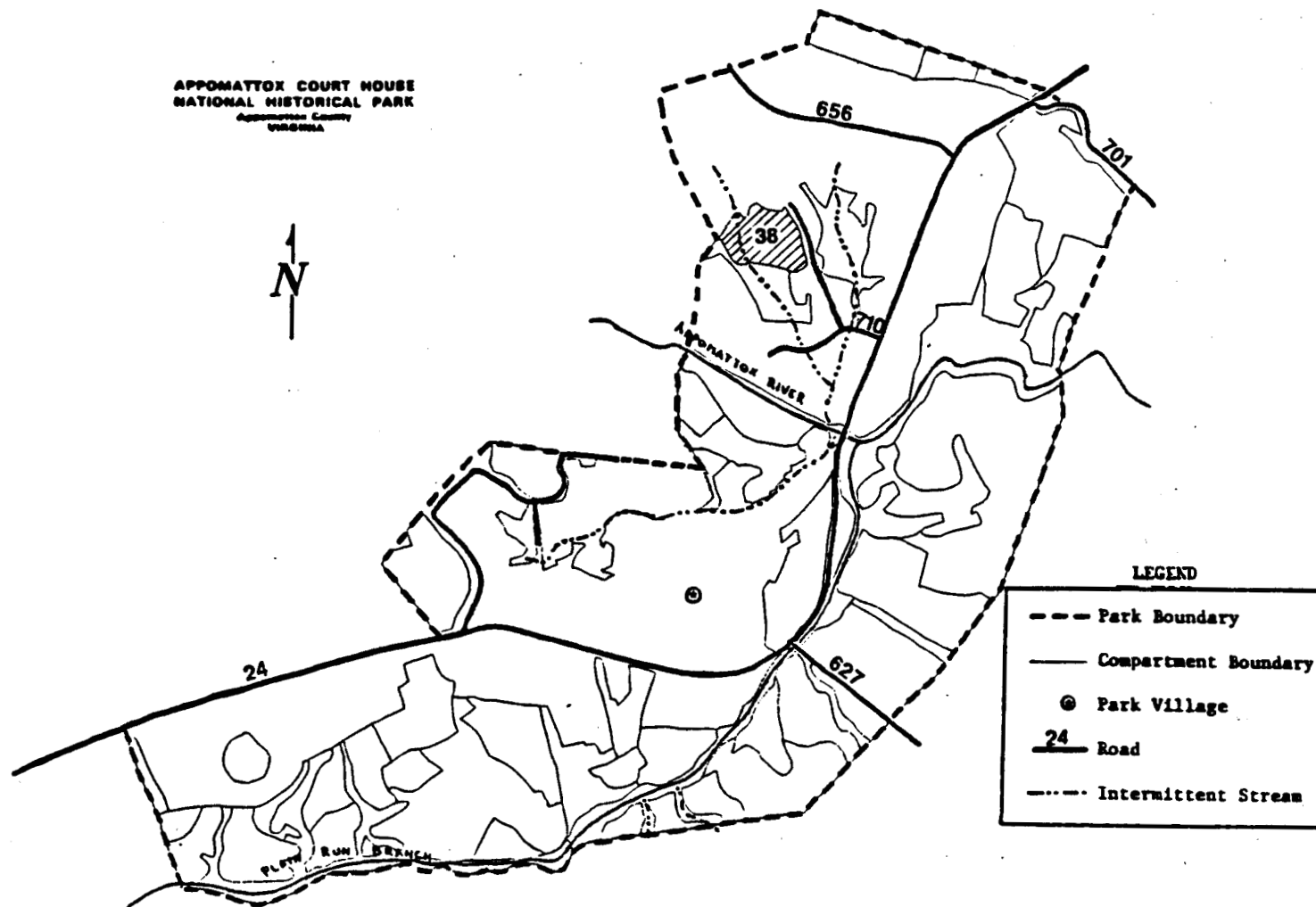


Figure 8: Location of Compartment 38 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Management Recommendation.

This loblolly pine stand should be thinned immediately to reduce the present basal area back to 70 to 80 square feet per acre. However, no more than 40 percent of the present total basal area should be removed during this thinning to minimize windthrow and ice damage to the residual stand. Subsequent thinnings will be necessary each time the total basal area reaches 130 to 140 square feet per acre. During the second and third thinnings, the basal area should be reduced to 75 to 85 and 80 to 90 square feet per acre, respectively. Then, in about 30 to 35 years, the southern half of this compartment (that side which is clearly visible from Virginia State Route 24) should be harvested. The northern half of the compartment should be harvested about 15 years later. Both halves should be allowed to naturally regenerate to ensure a good hardwood-pine mixture in subsequent stands. A fourth thinning will be necessary in the northern half of the compartment; this thinning should reduce the basal area per acre to 80 to 90 square feet per acre.

### Future Stand Conditions.

In 50 years, this compartment will be divided into two unique stand types. First will be the young, 15- to 18-year-old, mixed conifer-hardwood stand type; this will

occur on the southern half of the compartment (that area which was harvested first). The most prominent species in this portion of the compartment will be loblolly and Virginia pine, eastern redcedar, and a variety of upland hardwood species (mostly oaks, hickories, black locust, and red maple).

The second stand type present within this compartment will be that which occurs in the northern half of the compartment. This area will consist of 65- to 70-year-old loblolly pine; these will be large, sawtimber-sized trees with an average diameter at breast height of 15 inches (Walker, 1980). There will be several vertical strata composed of mixed hardwood-pine beneath the main canopy; these strata will occupy the site once the mature loblolly is harvested. Once the loblolly pine has been harvested, the stands should be evaluated at 10-year intervals for overall stand condition, including basal area, species composition and stand vigor.

Stand Type C: Pine (31- to 50-years-old)

This stand type represents Virginia pine stands on the Park which are between 31 and 50 years of age. These stands consist of naturally regenerated pine which developed following the abandonment of agricultural lands on the Park.

There are seven compartments, comprising a total of 93 acres, which fall into this stand type designation (Compartments 2, 11, 20, 32, 42, 44 and 45).

#### Present Stand Conditions

The forest stands of Pine Stand Type (31- to 50-years-old) are presently over-stocked with an average total basal area of 120 square feet per acre (Table 4). Approximately 96 percent of that total basal area is Virginia pine. There is an average of 183 stems per acre in the midstory of this stand type; the three major components are Virginia pine, eastern redcedar, and blackgum, in order of decreasing abundance. In the regeneration stratum fifteen species are present at an average total regeneration density of 4,884 stems per acre. The four major components of the regeneration stratum are red maple, southern red oak, willow oak, and white oak. Also present in the regeneration stratum are other oak species, Virginia pine, eastern redcedar, dogwood, blackgum, black cherry, American beech and hickory species, in order of decreasing abundance.

Table 4. Summary of characteristics for the overstory, midstory and regeneration strata for the Pine (31- to 50-year-old) Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>					
	Overstory		Midstory			Regeneration
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac) Percent of Total (%)
<i>Acer rubrum</i>	-	-	17	9	1.80	977 20
<i>Carya</i> spp.	-	-	-	-	-	147 3
<i>Cornus florida</i>	-	-	-	-	-	293 6
<i>Fagus grandifolia</i>	-	-	-	-	-	147 3
<i>Juniperus virginiana</i>	4	3	49	27	1.32	342 7
<i>Nyssa sylvatica</i>	1	1	35	19	1.25	195 4
<i>Pinus virginiana</i>	115	96	82	45	3.53	342 7
<i>Prunus serotina</i>	-	-	-	-	-	195 4
<i>Quercus alba</i>	-	-	-	-	-	488 10
<i>Quercus coccinea</i>	-	-	-	-	-	195 4
<i>Quercus falcata</i>	-	-	-	-	-	537 11
<i>Quercus marilandica</i>	-	-	-	-	-	49 1
<i>Quercus phellos</i>	-	-	-	-	-	537 11
<i>Quercus stellata</i>	-	-	-	-	-	147 3
<i>Quercus velutina</i>	-	-	-	-	-	293 6
Totals	120	100	183	100	-	4884 100

1. The site quality index (base age 50 years) for this forest cover type is 78 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 70 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata that makeup the vertical structure of a forest: the overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.



### Future Stand Conditions

Each of the seven compartments in this stand type will be managed in the same manner, thereby creating similar future stand conditions for each of the compartments. Therefore, these conditions will be discussed here for the group as a whole.

After 50 years, this stand type will be a generally even-aged upland hardwood forest cover type with a small component of pine. The oaks will probably be the dominant species, followed closely by beech, red maple, and hickory, with blackgum being only a minor component. One would initially expect to find mostly oaks and hickories in the regeneration because of their ability to reproduce beneath the shade of an established canopy. However, over time one would expect to find increasing amounts of beech, red maple, and dogwood because they are even more shade tolerant than the oak and hickory.

### Compartment 2

#### Description and Location.

Compartment 2 is a 3-acre, 40- to 45-year-old Virginia pine stand located along the western boundary of the Park. It is visible from Virginia State Route 24 because open fields border its western edge. These fields allow good access to the compartment (Figure 9).

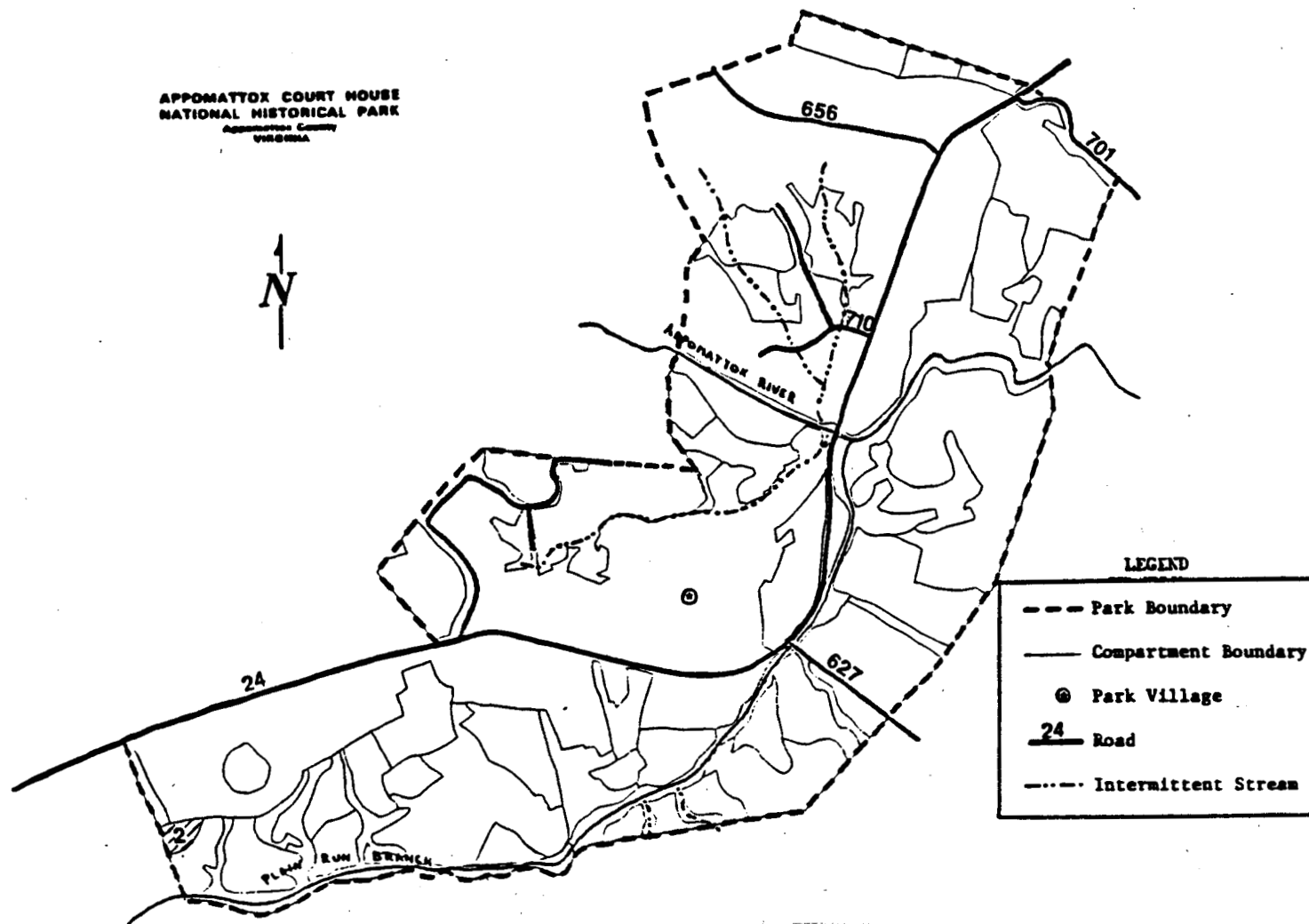


Figure 9: Location of Compartment 2 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

This compartment is located on two different soil series. The majority of the stand is located on the Iredell loam series, the remainder on the Cullen loam series. It is advisable to keep all forest management activities in this compartment confined to the driest months of the year because the clayey subsoil in the Iredell can often impede water drainage, thereby creating significant access problems during the wetter months.

Management Objective.

This compartment will be used to create a forested buffer along the Park's perimeter. It may be necessary to leave a large portion of this compartment intact for the next 8 to 10 years to reduce the visual impact of harvesting neighboring stands in this corner of the Park.

Management Recommendation.

The trees located in the interior of this compartment should be harvested, and the compartment should be naturally regenerated. However, a 100 to 150 foot buffer strip should be left along the northern and western edges of the compartment (Figure 9). Buffer strips located here will reduce the visual impact of the harvest. These buffer strips should be left in place until a sufficient amount of regeneration is established. After about 5 to 8 years these strips should be harvested. Although blowdown may occur

within the buffer strips, it will pose no significant problems for the successful establishment of the stand. All snags (standing dead trees) within the strips should be felled. The felled snags and any windthrown trees should be removed from the site to reduce the amount of fuel and to facilitate a more uniform distribution of the regeneration.

Site disturbance will be minimized by harvesting during the late summer because it tends to be the driest part of the year in this region. In addition, natural seed fall for the Virginia pine occurs between October and January (USDA, 1965). Thus, to maximize the seed source from adjacent pine stands that have not yet been harvested and to minimize site disturbance, the salvage operation should be carried out in late summer. This management recommendation is not aimed at regenerating a Virginia pine stand. However, in portions of this compartment, the amount of advanced hardwood regeneration is limited. Therefore, pine regeneration is acceptable until hardwood species can become established.

### Compartment 11

#### Description and Location.

Compartment 11 is a 5-acre Virginia pine stand with an average stand age of 35 to 40 years which is located along the present history/nature trail (Figure 10). This stand can be easily accessed from this trail.

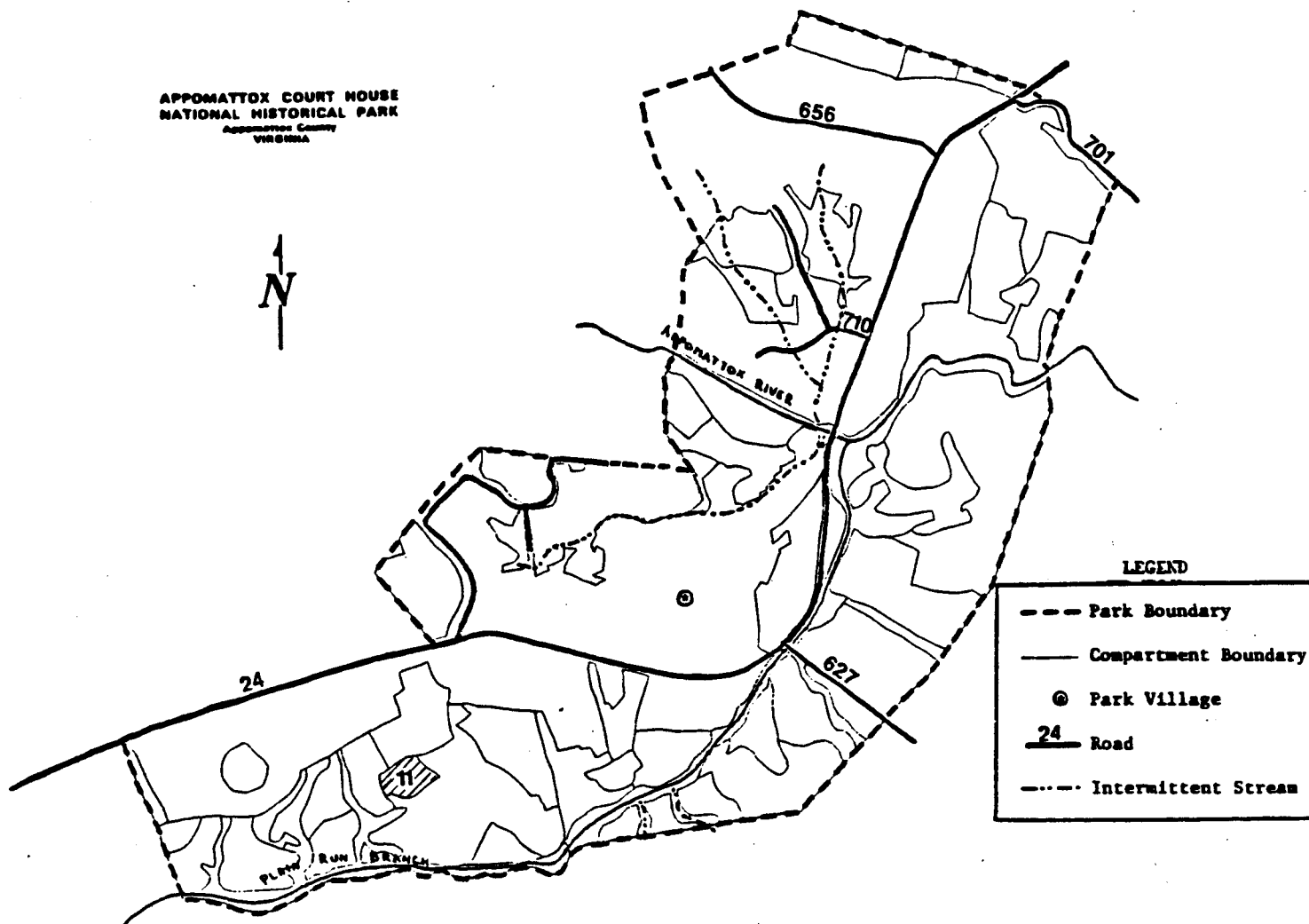


Figure 10: Location of Compartment 11 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

This compartment is located on both the Cullen and the Iredell loam series. Therefore, all management activities should be carried out during dry times of the year.

Management Objective.

Compartment 11 will be used to create a forested buffer along the Park's perimeter. This stand currently has merchantable timber. Therefore, even though the stand is not yet overmature and in need of immediate salvaging, it can be harvested now and sold in combination with some of the less desirable pine stands in this area in hopes of getting any salvagable pines in the less desirable stands removed.

Management Recommendation.

The Virginia pine in this compartment should be harvested immediately, and the compartment should be allowed to naturally regenerate. It is not readily visible from Virginia State Route 24, nor is there much blowdown within the stand to complicate the harvest. If this stand is not harvested soon, a large portion of the merchantable timber could be lost because there is a high probability that significant decline will occur within the next 8 to 10 years. In addition, this compartment can serve as an incentive to get loggers into the less desirable, overmature Virginia pine stands (lying adjacent to or close to this

compartment) and perform the desperately needed sanitation cuts in these stands.

During the harvest, only the overstory pines should be removed; none of the midstory stratum (pine or hardwood) should be removed from the site because this advanced regeneration will be the major source of the ensuing stand and its presence will help to reduce the visual impact of the harvest. Care should be taken to prevent unnecessary injury to this advanced regeneration.

The Iredell loam soil series limits the use of equipment in this compartment because this series is usually wet more than three months out of the year. Harvesting during dry weather will reduce the amount of site disturbance from the use of heavy equipment.

## Compartment 20

### Description and Location.

Compartment 20, which is located south of the Park village, is visible from Virginia State Route 24 (Figure 11). The Virginia pine within this 11-acre compartment are approximately 40- to 45-years-old, and currently show no sign of wind and/or ice damage. This stand is bounded along its eastern and southern edges by Plain Run Branch. Slopes along these edges of the compartment are slightly greater

(ranging from 7 to 15 percent) than those slopes typical for the Park (ranging from 2 to 7 percent). The stand is bordered along its western edge by an open field which is not visible from the Park village. Therefore, access to this stand can be made via the open field, allowing the northern edge of the compartment to remain as a visual screen when the present stand is harvested.

This compartment is located on two soil series, the Cullen loam series and the Iredell loam series. The presence of the Iredell series makes it necessary to perform all forest management activities during dry periods.

#### Management Objective.

This compartment will be used to create a forested buffer along the Park's perimeter. However, this compartment is backed-up by several hundred feet of mixed-hardwood stands. Therefore, it is not imperative that this compartment be maintained in pure pine after the harvest of the present stand; so, it will be managed to enhance the natural transition from pure pine to a pine-hardwood mixture.

#### Management Recommendation.

Although this stand does not currently show any signs of ice and/or wind damage, it has the potential to suffer damage in much the same way as the older Virginia pine stands. Therefore, within the next 10 years, this stand



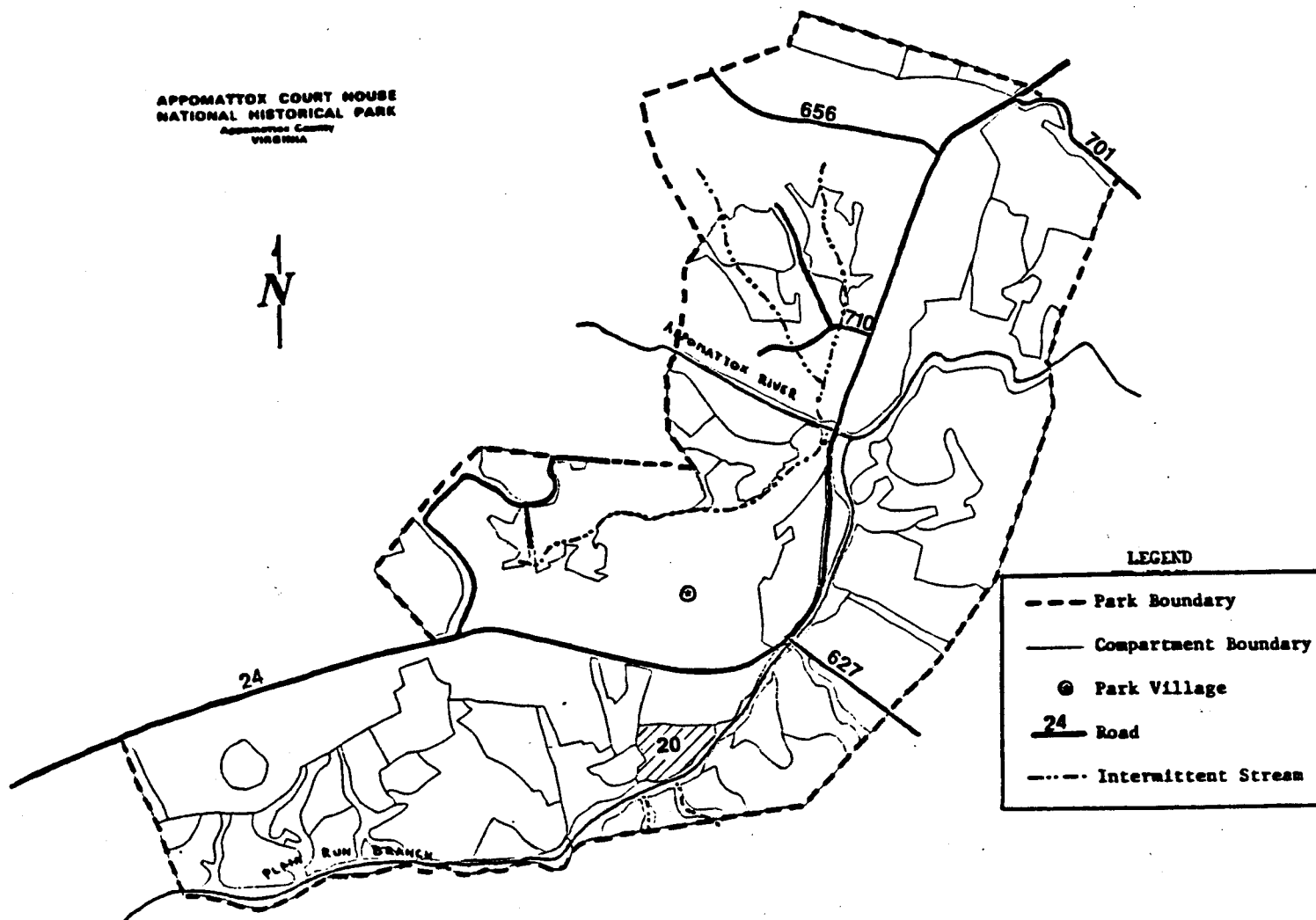


Figure 11: Location of Compartment 20 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

should be harvested. It would be best to leave a 100 to 150 foot wide buffer strip along the northern edge of this compartment to reduce the visual impact of the harvesting of this stand. This buffer strip can then be removed within 4 to 10 years after the harvest depending on the amount of regeneration that successfully becomes established during that time. Following the harvest, this compartment should be allowed to naturally regenerate.

### Compartment 32

#### Description and Location.

Compartment 32, which is located towards the northern edge of the Park near Robert E. Lee's headquarters, is readily visible from Virginia State Route 24 (Figure 12). The Society of American Foresters (SAF) self-guided nature trail runs along the northern and eastern boundaries of this compartment, with an interpretive plaque describing the stand just alongside the edge of this compartment. The Virginia pine in this 16-acre compartment are about 45- to 50-years of age, and are just beginning to show signs of wind and/or ice damage. A younger age class of 10- to 15-year-old pines has developed along the open edge of this stand (Figure 12). These younger pines can provide a necessary buffer to help reduce the visual impact from harvesting the older pines.

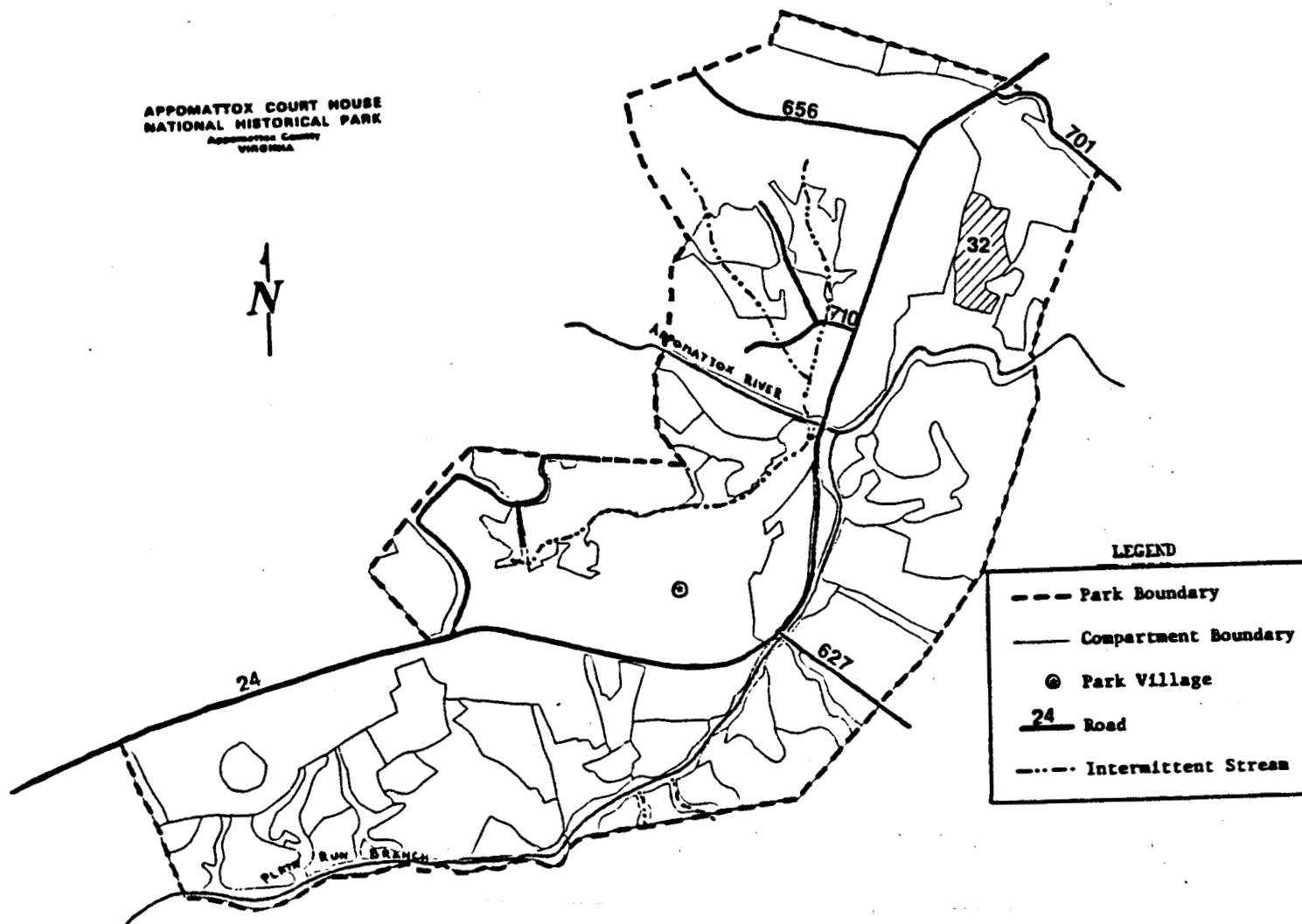


Figure 12: Location of Compartment 32 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

Compartment 32 is located primarily on the relatively productive, gently sloping Cullen loam soil series. However, portions of the stand are on the steeper slopes (ranging from 15 to 25 percent) of the Poindexter fine sandy loam soil series. Along these steeper gradients, the compartment borders an intermittent stream which drains into the Appomattox River.

Management Objective.

This compartment, which will be used to create a forested buffer along the Park's perimeter, must be carefully monitored to assure that visitor safety is addressed because this is a high use area of the Park, and windthrown trees could prove very hazardous to hikers.

Management Recommendation.

This stand has begun to show signs of ice and/or wind damage; therefore, it is important that it be harvested within the next year or so. The younger Virginia pines located along the open edge of this compartment should be left intact to provide a visual buffer. These younger pines will help reduce the visual impact resulting from the harvest. However, they are still young; therefore, they will not need to be removed once regeneration is established because there will not be a significant difference between the age of the trees in the buffer and that of the newly-regenerated trees.

Access to this compartment is a problem because of the high visibility of this stand. It seems best to enter this stand along a single-lane logging road from the open fields fronting Virginia State Route 24. The access road should enter the stand at an angle so as not to provide a clear (unobstructed) view into the harvested stand.

#### Compartments 42, 44 and 45

##### Description and Location.

These three compartments provide the only visual buffer along this portion of the northwestern edge of the Park that effectively screens out all activities which would otherwise be readily visible to the Park village visitors. The Virginia pine in these compartments is approximately 35 to 40 years of age and currently shows no signs of wind and/or ice damage.

Compartment 42, is a 14-acre tract situated primarily along a ridgetop running parallel with the Appomattox River (Figure 13). Some of the land within the adjacent 35-acre Compartment 44 and the 9-acre Compartment 45 is controlled by the provisions of scenic easements established between the National Park Service and private landowners (Figure 13). Portions of all three compartments lie along Scott's Branch, an intermittent stream which flows into the Appomattox River.

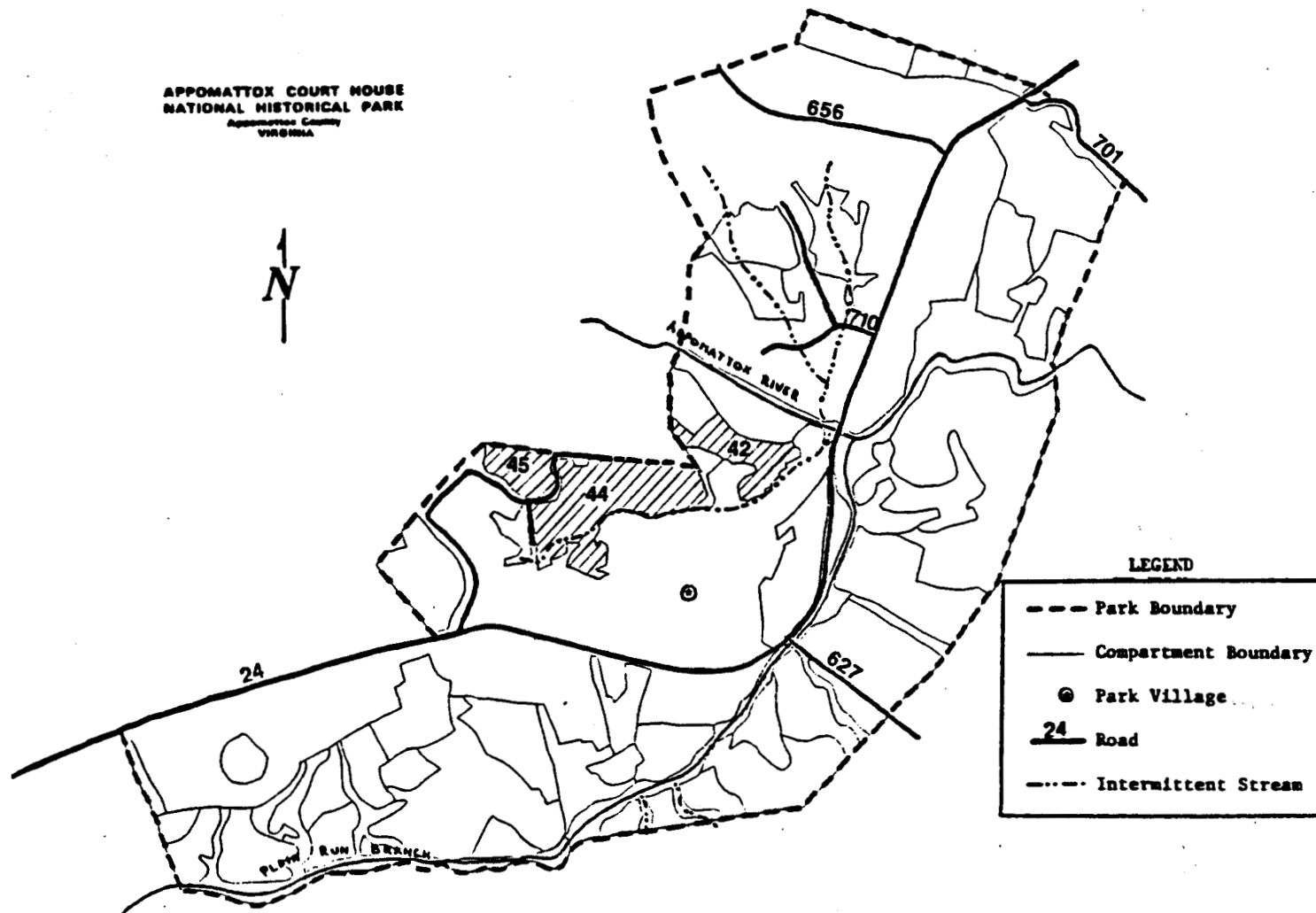


Figure 13: Location of Compartments 42, 44 and 45 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

These compartments are located primarily on the Cullen loam soil series. However, along Scott's Branch, the Starr loam series is typically found. Although these soil series have few limitations restricting their use, the presence of the intermittent stream requires that all forest management activities be carried out during the driest part of the year so as to reduce the possible impacts on the stream and the Appomattox River.

Management Objective.

These compartments will be used as visual screens to hide from view those land uses outside the Park boundaries which might adversely affect the Park visitor's experience. Although only a total of 8 acres in these compartments is governed by a scenic easement clause, the wishes of the private landowners must be determined before beginning any forest management activities.

Management Recommendation.

It is best to allow these three compartments to progress into mixed hardwood-pine stands rather than maintain these compartments in pure pine. The present size of Compartments 42, 44 and 45 (14, 35 and 9 acres, respectively) is sufficient such that adequate and effective screening will be provided by a pine-hardwood mixture. A thinning now, where 40 to 45% of the total basal area is removed, will

provide additional light within the stands so that the hardwoods can develop much more rapidly, creating a more vigorous understory to help reduce the visual impact resulting from the final harvest of these pines. The harvest time of the present stands is not critical, however, they should probably be harvested and regenerated within the next 10 to 15 years.

Access is readily available for all three compartments because of the presence of an old road into the area. The road is gravelled as it passes between Compartments 44 and 45; however, beyond that, the road has been seeded with grasses. Slight improvements will need to be made to the road to provide suitable access to Compartment 42 for the harvesting operation.

Stand Type D: Pine (50+ years old)

This stand type is represented by those pine stands which are greater than 50 years of age and overmature. Most of the problem areas on the Park today are these overmature pine stands because they are suffering from windthrow and/or severe ice damage. The twelve compartments which fall into this stand type total 164 acres (Compartments 3, 5, 9, 10, 12, 19, 21, 22, 24, 26, 28, and 29).



### Present Stand Conditions

Stocking is not consistent across all compartments within this stand type. Some stands are quite dense with an average total basal area of 138 square feet per acre (Table 5). However, other stands are open because of windthrow of the overmature pines. The windthrow has resulted in increased light within these stands and, consequently, a much higher hardwood midstory and hardwood regeneration density has developed.

In the fully-stocked portions of these stands, approximately 85 percent of the total basal area is pine (Table 5); this 85 percent is composed of 74 percent Virginia pine and 11 percent shortleaf pine. Mixed hardwoods make up 13 percent, and eastern redcedar contributes the remaining 2 percent of the total basal area. The average total midstory density of the overmature stands is 522 stems per acre. The four major components, in decreasing order of abundance, are dogwood, red maple, blackgum, and Virginia pine. The well-stocked regeneration stratum has an average total density of 8,938 stems per acre. The three major species found in the regeneration stratum are dogwood, red maple and willow oak, in order of decreasing abundance.

Table 5. Summary of characteristics for the overstory, midstory and regeneration strata for the Pine (50+ year old) Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Acer rubrum</i>	1	1	93	18	1.94	1251	14
<i>Carpinus caroliniana</i>	-	-	-	-	-	89	1
<i>Carya</i> spp.	-	-	2	10	1.00	358	4
<i>Cercis canadensis</i>	-	-	-	-	-	89	1
<i>Cornus florida</i>	4	3	135	26	2.19	3039	34
<i>Crataegus</i> spp.	-	-	-	-	-	179	2
<i>Fagus grandifolia</i>	-	-	-	-	-	89	1
<i>Fraxinus</i> spp.	1	1	15	3	1.55	179	2
<i>Juniperus virginiana</i>	3	2	47	9	2.80	89	1
<i>Liriodendron tulipifera</i>	4	3	15	3	2.75	89	1
<i>Nyssa sylvatica</i>	3	2	68	13	2.00	268	3
<i>Pinus echinata</i>	11	15	-	-	-	-	-
<i>Pinus virginiana</i>	104	75	63	12	3.84	180	2
<i>Prunus serotina</i>	-	-	-	-	-	180	2
<i>Quercus alba</i>	-	-	-	-	-	268	3
<i>Quercus falcata</i>	1	1	15	3	1.60	447	5
<i>Quercus marilandica</i>	-	-	-	-	-	89	1
<i>Quercus phellos</i>	1	1	10	2	2.20	1430	16
<i>Quercus rubra</i>	-	-	-	-	-	89	1
<i>Quercus stellata</i>	-	-	20	4	1.73	89	1
<i>Quercus velutina</i>	1	1	31	6	3.03	447	5
Totals	138	100	522	100	-	8938	100

1. The site quality index (base age 50 years) for this forest cover type is 73 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 65 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata found in the vertical structure of a forest: overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.

### Management Objective

All of the compartments in this stand type will be used to create a forested buffer along the Park's perimeter. Therefore, the management objective for these compartments is to maintain the stands in a vigorous and healthy condition to provide the best possible screening. It is especially important that the present fuel-loading conditions in each of these compartments be reduced substantially to help reduce the potential fire hazard.

### Management Recommendation

Due to the present stand conditions typical of this stand type, all immediate forest management activities within the Park should be concentrated on the twelve compartments which make up this stand type. Salvage and/or sanitation cuts should be used immediately to remove all of the merchantable pine that still remains in each of these compartments. Each compartment within this stand type will then be allowed to naturally regenerate. During the harvesting of these merchantable pines, loggers should fall all snags (except for 10 to 12 in each compartment to be left for wildlife den trees and perches) in these compartments. Felled trees will decay much more rapidly and thus pose less of a fire threat than will dead snags which are left standing or lodged

against other trees. The removal of the merchantable pines and the snags will help prevent damage to the residual hardwood stands that have developed beneath the overmature pines.

#### Future Stand Conditions

After 50 years, these stands will be composed almost entirely of mixed upland hardwoods. There will be very little pine in the overstory in 50 years because there is so much advanced hardwood regeneration currently in this stand type. In addition, there will be very little soil disturbance during the harvesting operation, thus limiting seedbed conditions necessary for pine regeneration. The major hardwood species in the upland hardwood forest type will be the oaks and hickories. Over time, beech and red maple will become more prevalent, along with blackgum, ash, and willow oak, all three in lesser amounts.

Within each compartment, moist, rich sites will be composed of bottomland hardwood species including red maple, beech, green ash and yellow-poplar.

Compartments 3, 5, 9 and 10Description and Location.

These four compartments, containing 65- to 70-year-old overmature Virginia pine, are located in the southwestern portion of the Park (Figure 14). Access is a problem; therefore, the proposed road for this portion of the Park, described on pages 130-134, will greatly enhance the present access.

Compartment 3 is an 8-acre tract located on the Iredell and the Cullen loam series. Compartment 5 is a 13-acre compartment located on the Iredell loam and the Enon fine sandy loam soil series. Compartment 9 is an 8-acre tract located on the Iredell loam series. Compartment 10 is also a 8-acre compartment. It is located on the Iredell and the Cullen loam soil series. The presence of the Iredell series in all of these compartments makes it necessary to limit all forest management activities to dry periods during the year.

Compartment 12Description and Location.

Compartment 12, a 47-acre compartment, is located adjacent to the history/nature trail west of the point at which the trail crosses Plain Run Branch (Figure 15). This

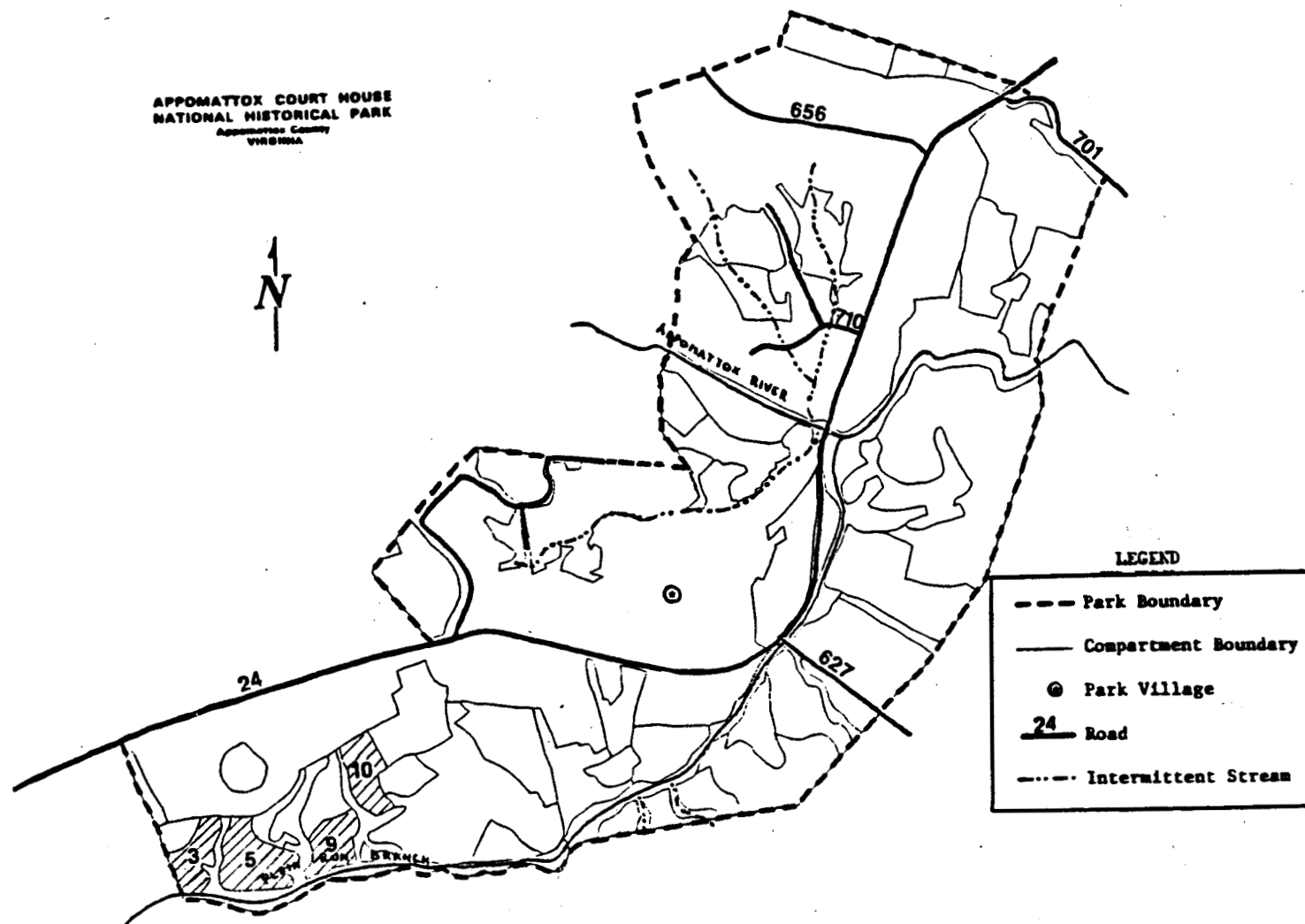


Figure 14: Location of Compartments 3, 5, 9 and 10 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

trail will provide access when forest management activities are necessary within the compartment. The compartment consists of a mixture of Virginia pine and shortleaf pine with an average stand age of 70 to 75 years. The majority of the trees in this compartment have suffered from windthrow and ice damage, and this stand is presently in a severe state of decline.

Compartment 12 is located primarily on the gently sloping Iredell loam and Cullen loam soil series. However, a small amount of this compartment is located on the Starr loam series. Again, the Iredell series places restrictions on equipment use in this compartment.

#### Compartments 19, 21 and 22

##### Description and Location.

These three compartments are located along the southern boundary of the Park and consist of 50- to 55-year-old Virginia pine (Figure 16). Plain Run Branch delineates the northwestern border of these compartments, while the history/nature trail forms the southern border along these compartments. This trail will provide easy access to these three small compartments (Compartments 19 and 21 are each 3 acres, and Compartment 22 is 6 acres) when management activities are necessary.

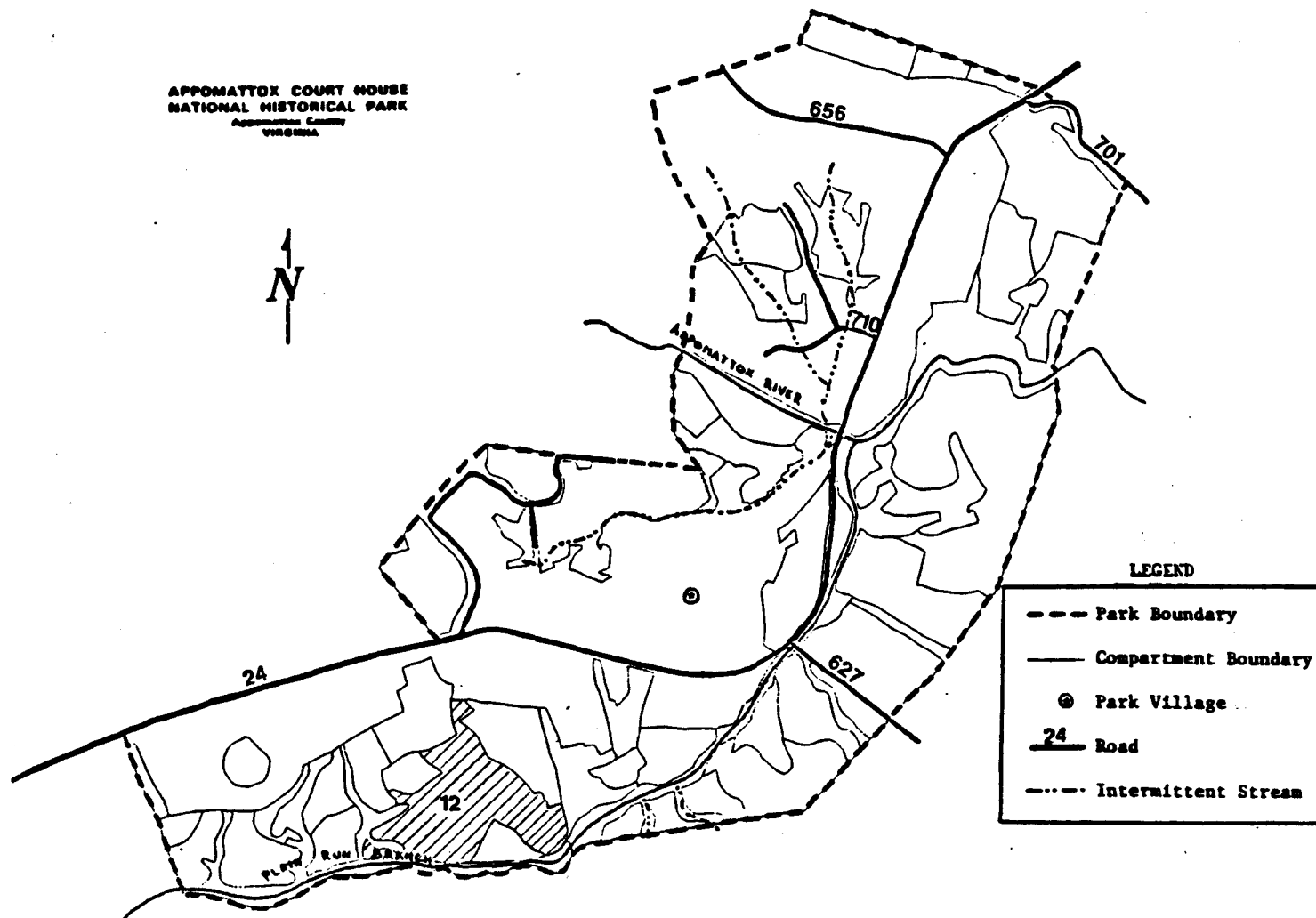


Figure 15: Location of Compartment 12 in the Appomattox Court House National Historical Park, Appomattox, Virginia.



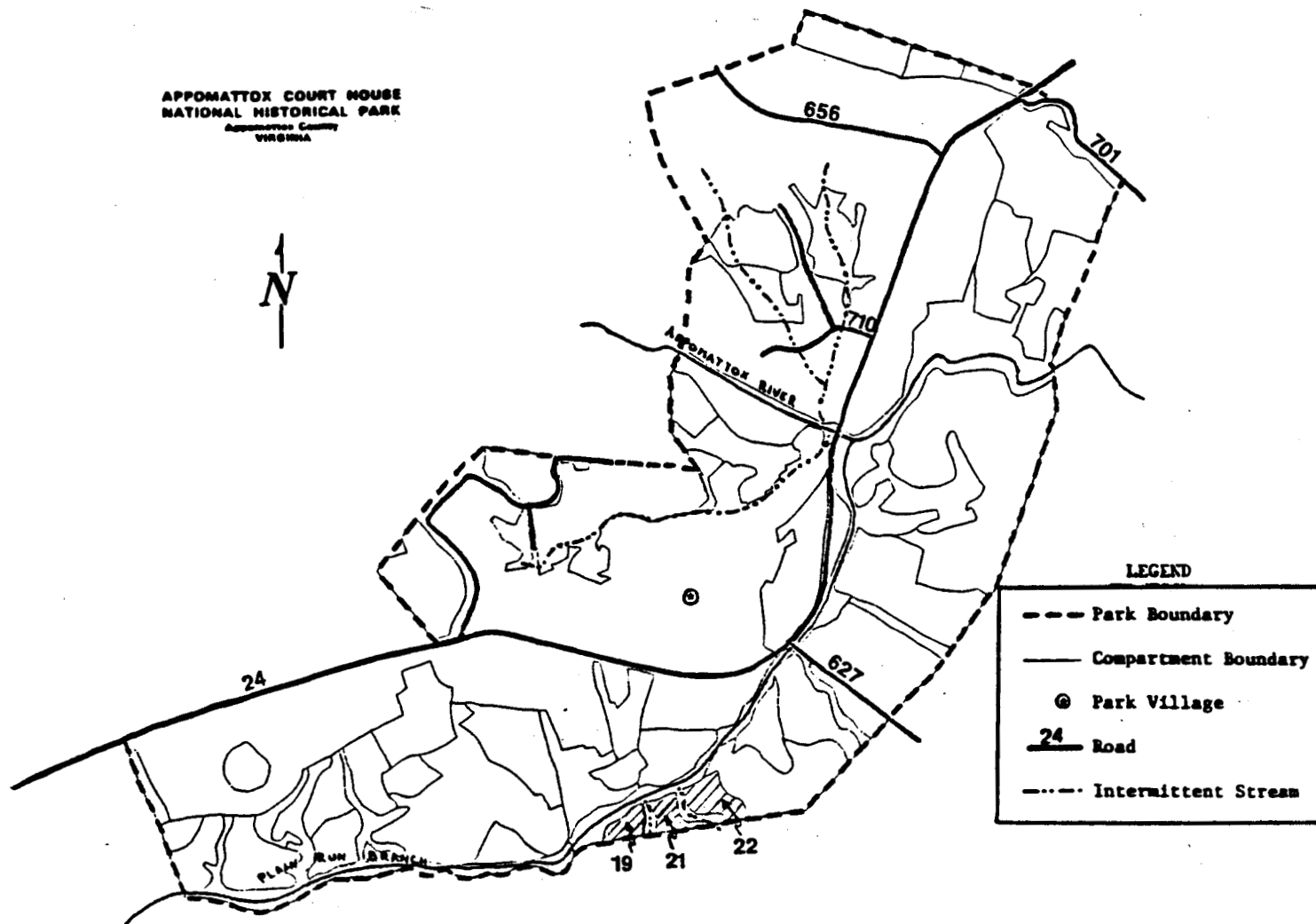


Figure 16: Location of Compartment 19, 21 and 22 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

All three compartments are located on the Poindexter fine sandy loam and the Iredell loam soil series. Both of these soils pose certain management constraints, the Poindexter because of its relatively steep slope and the Iredell because of its clayey subsoil.

#### Compartment 24

##### Description and Location.

Compartment 24 is an 8-acre compartment of 50- to 55-year-old Virginia pine that is bordered along its western edge by Plain Run Branch (Figure 17). The majority of the stand is found on the gently to moderately sloping Cullen loam soil series. The remainder of the compartment falls on the Poindexter fine sandy loam and the Enon fine sandy loam. The slope in a large portion of this compartment is between 15 and 20 percent. However, this should not significantly hamper any forest management activities within the compartment, but care should be taken so as not to unnecessarily disturb the slopes within this compartment.

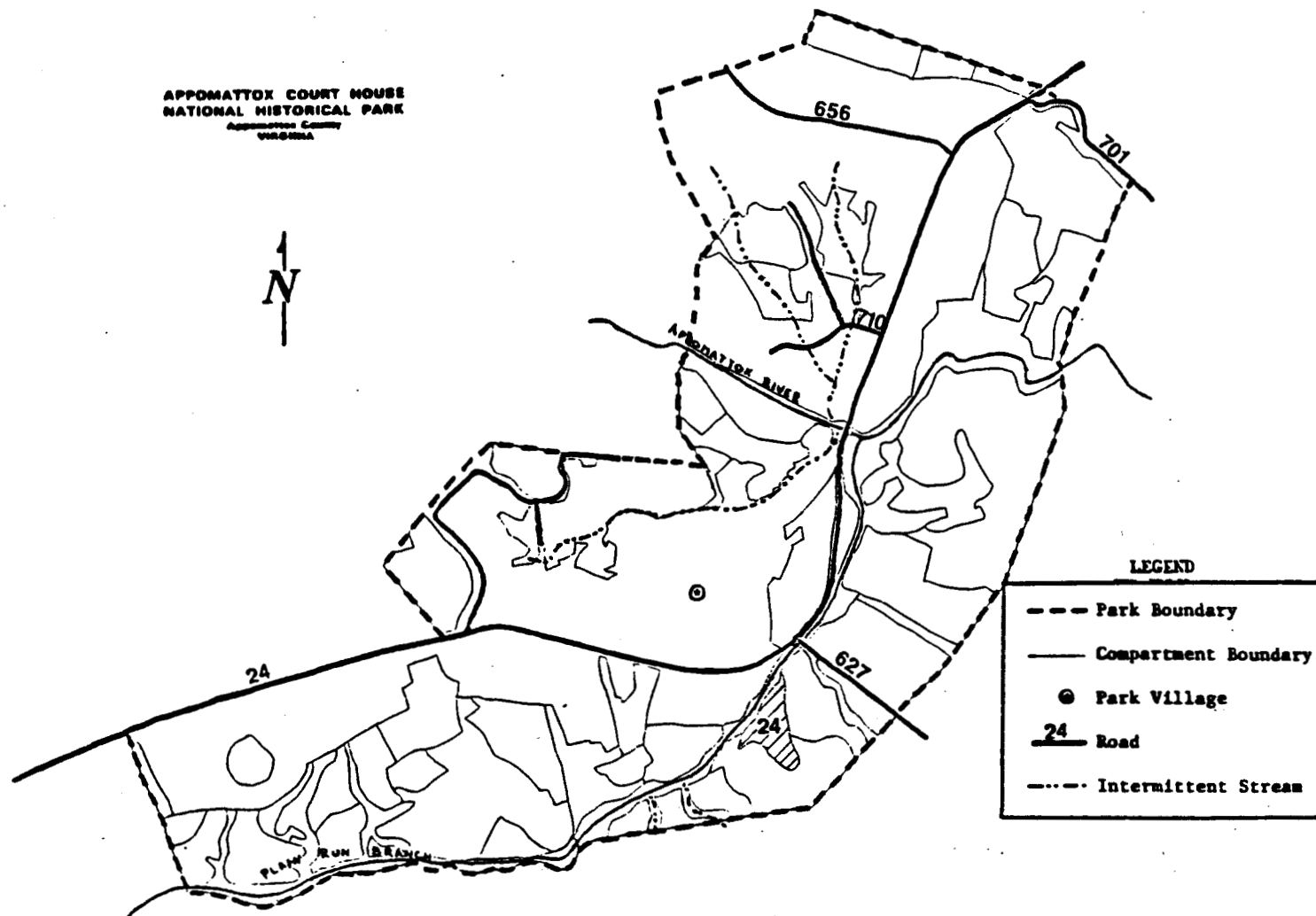


Figure 17: Location of Compartment 24 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Compartment 26

#### Description and Location.

Compartment 26 is a 5-acre compartment which lies adjacent to Route 627; it is bordered along its western edge by an intermittent stream and along its eastern edge by the Park boundary line (Figure 18). This compartment presently shows signs of blowdown and ice damage to the overmature Virginia and shortleaf pines.

The stand is located on the Tatum and the Georgeville silt loam series. Care must be taken when working in this compartment so as not to drastically disturb the site because of its relatively steep slopes (ranging from 25% to 40%).

### Compartment 28

#### Description and Location.

Compartment 28, a 27-acre tract, is a mixture of native 60- to 65-year-old Virginia and shortleaf pines. It is located northeast of the intersection between Route 627 and Virginia State Route 24 (Figure 19). The stand is just beginning to show signs of wind and/or ice damage. Access to this compartment is readily available via the history/nature trail which runs along the northwestern edge

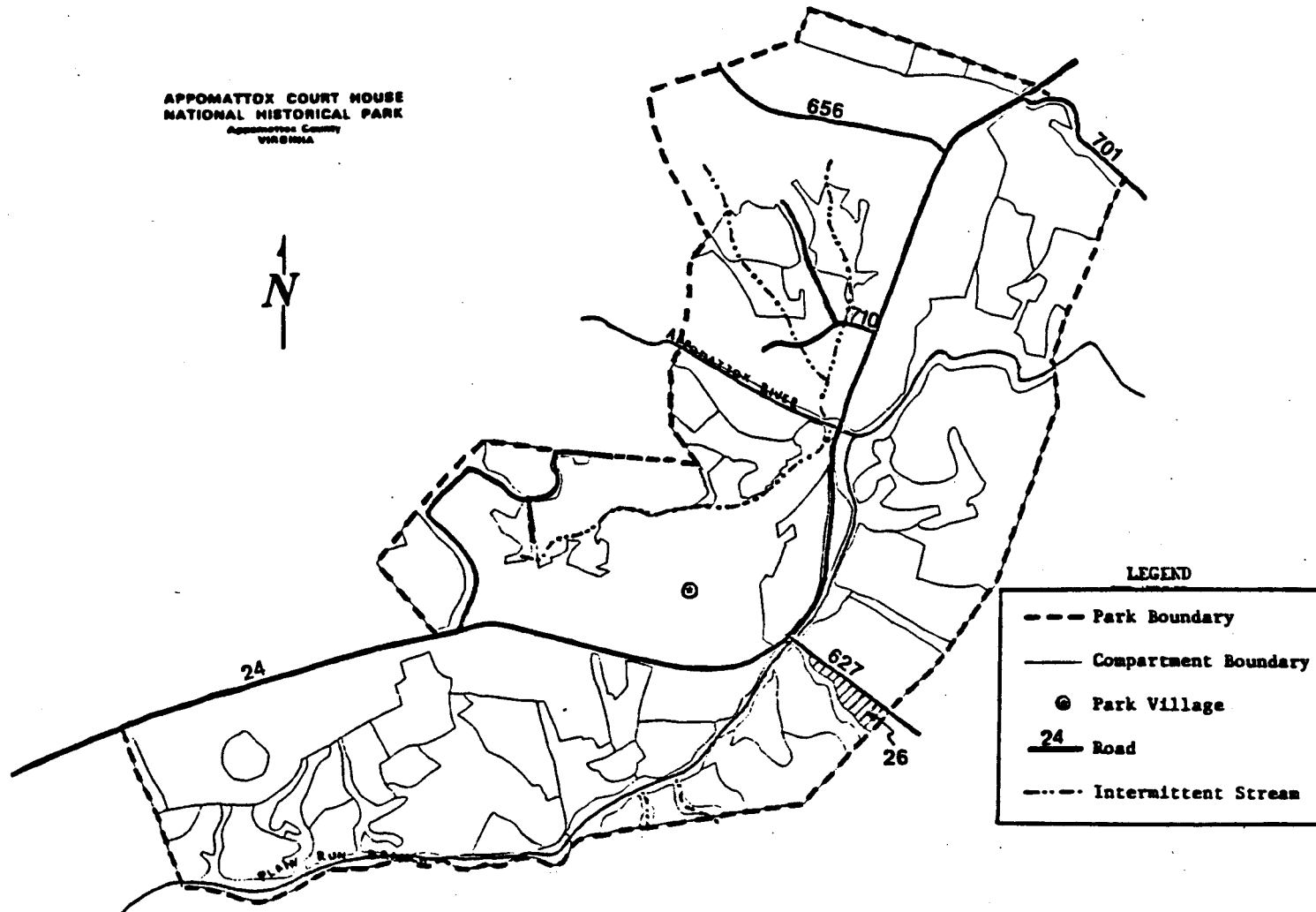


Figure 18: Location of Compartment 26 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

of the compartment. In addition, the powerline right-of-way borders this compartment along its northern edge; it too provides access to this compartment.

This compartment is located on the gently sloping Georgeville silt loam and Tatum silt loam soil series, neither of which poses any significant management problems.

### Compartment 29

#### Description and Location.

Compartment 29 is a 28-acre stand of native 60- to 65-year-old Virginia and shortleaf pines. It lies northeast of Compartment 28; the two compartments are separated by a powerline right-of-way (Figure 20). The history/nature trail runs through Compartment 29 providing ample access for the implementation of the management activities.

The soils underlying Compartment 29 are slightly different than those underlying Compartment 28. Both the Georgeville and the Tatum silt loam are found in Compartment 29 (the Georgeville accounting for a larger portion of the Compartment than the Tatum). However, the majority of this stand is located on the Cullen clay loam and Cullen loam series.

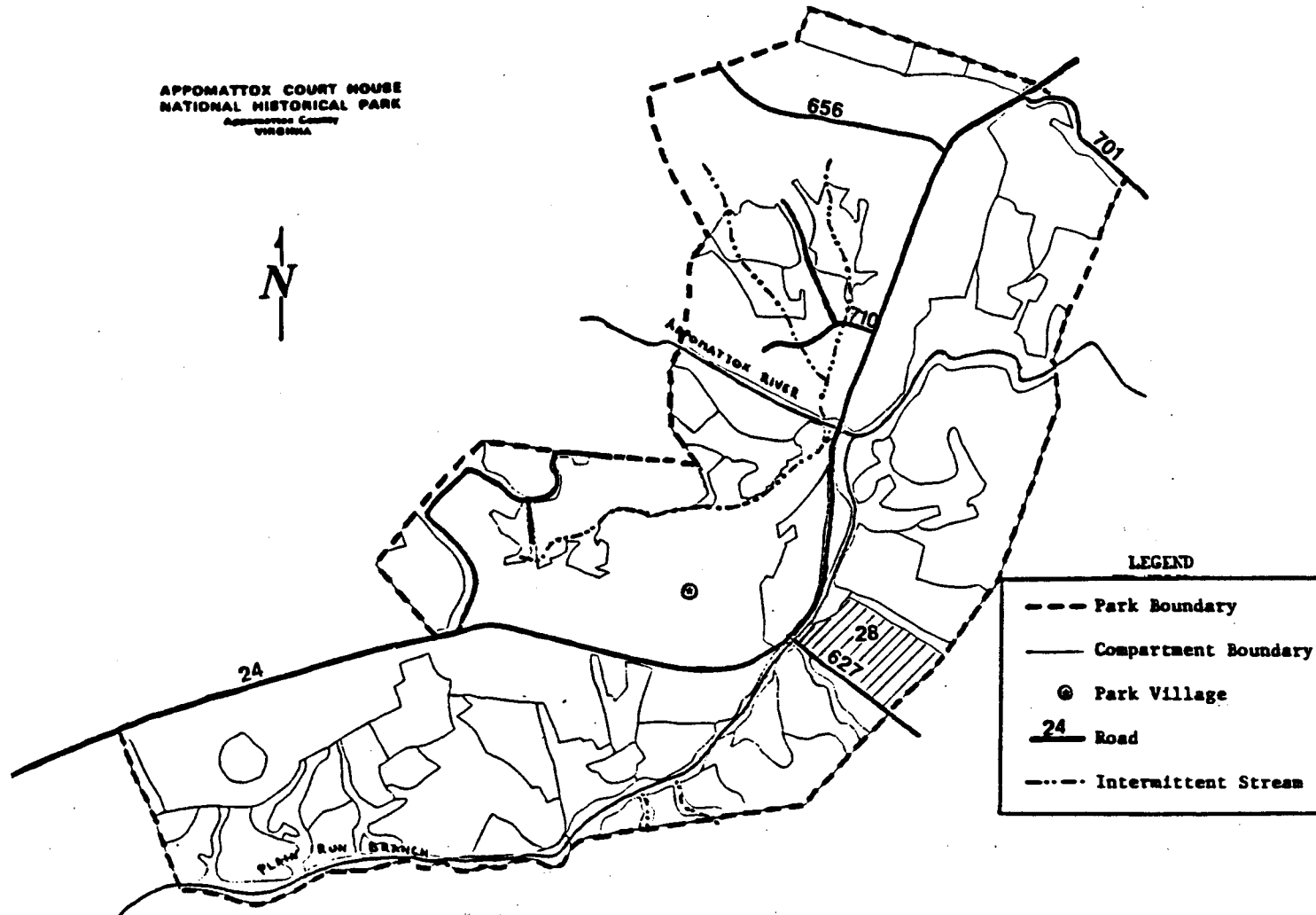


Figure 19: Location of Compartment 28 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

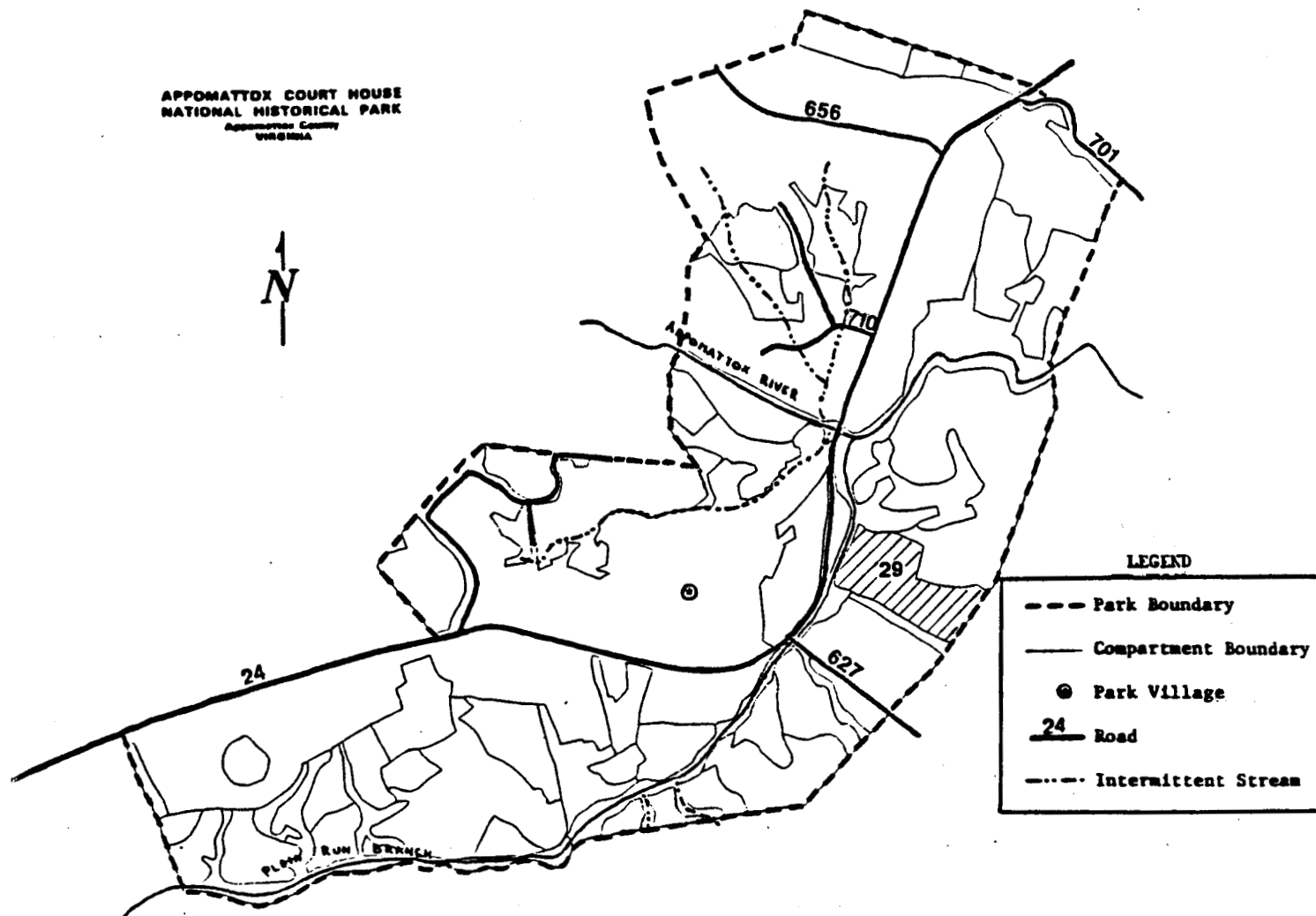


Figure 20: Location of Compartment 29 in the Appomattox Court House National Historical Park, Appomattox, Virginia.



Stand Type E: Young Mixed Conifer - Hardwood

This stand type, which represents those stands consisting of a mixture of young conifers and hardwoods, totals 48 acres. There are two subsections within this stand type designation. There are those compartments which were recently cutover or severely disturbed (Compartments 36 and 48), and there are those compartments which were old fields and have just recently been invaded by early successional species (Compartments 39 and 46).

Present Stand Conditions

Compartment 36, a 13-acre tract, is located along the northern edge of the Park boundary. Compartment 48, a 21-acre tract, is located adjacent to Virginia State Route 24, at the foot of the hill leading to the Park workcenter (Figure 21). Both of these compartments average 10 to 15 years of age. Each of these compartments has a wide variety of species present. Of the 1300 average total number of stems per acre, Virginia pine contributes 25 percent; it is followed in order of decreasing abundance by hickory species (22%), yellow-poplar (12%), dogwood (10%), white oak (8%) and chestnut oak (8%) (Table 6). Black oak, black locust, blackgum and black cherry each comprise 5 percent or less of the total number of stems. The average dbh of these species

varies considerably, however, the average diameter across all species is 3.9 inches.

Compartment 39, a 10-acre tract, is located west of Route 710, and Compartment 46, a 4-acre tract, is located near the northwestern Park boundary (Figure 22). Both of these compartments represent old fields which have recently been invaded by woody species which are between 6 and 10 years of age. These compartments are sparsely vegetated with a variety of species, the most prominent being Virginia pine and eastern redcedar, both of which are considered the pioneer species in old-field succession. (For a more complete discussion of old-field succession please refer to pages 9 through 12.) There are also several hardwood species found in these two compartments, the most common of these including black locust, black cherry, and several species of oak.

#### Management Objective

The location of each of these compartments makes it important that they all become and remain established by woody vegetation to help create the forested buffer along the perimeter of the Park. However, it is not necessary to encourage pine in these stands; the size of each compartment is such that a mixed pine-hardwood stand will provide a sufficient buffer.

Table 6. Summary of stand characteristics for the Young, Mixed Conifer-Hardwood Stand Type on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Compartment	Area (acres)	Stand Age (years)	Stand Density <sup>1</sup> (trees/acre)
36	13	10-15	1300
39	10	6-10	-
46	4	6-10	-
48	21	10-15	1300

1. A stand density measurement for Compartments 39 and 46 would not be helpful because the woody vegetation was not only sparse, but it was also inconsistent in amount across these compartments.

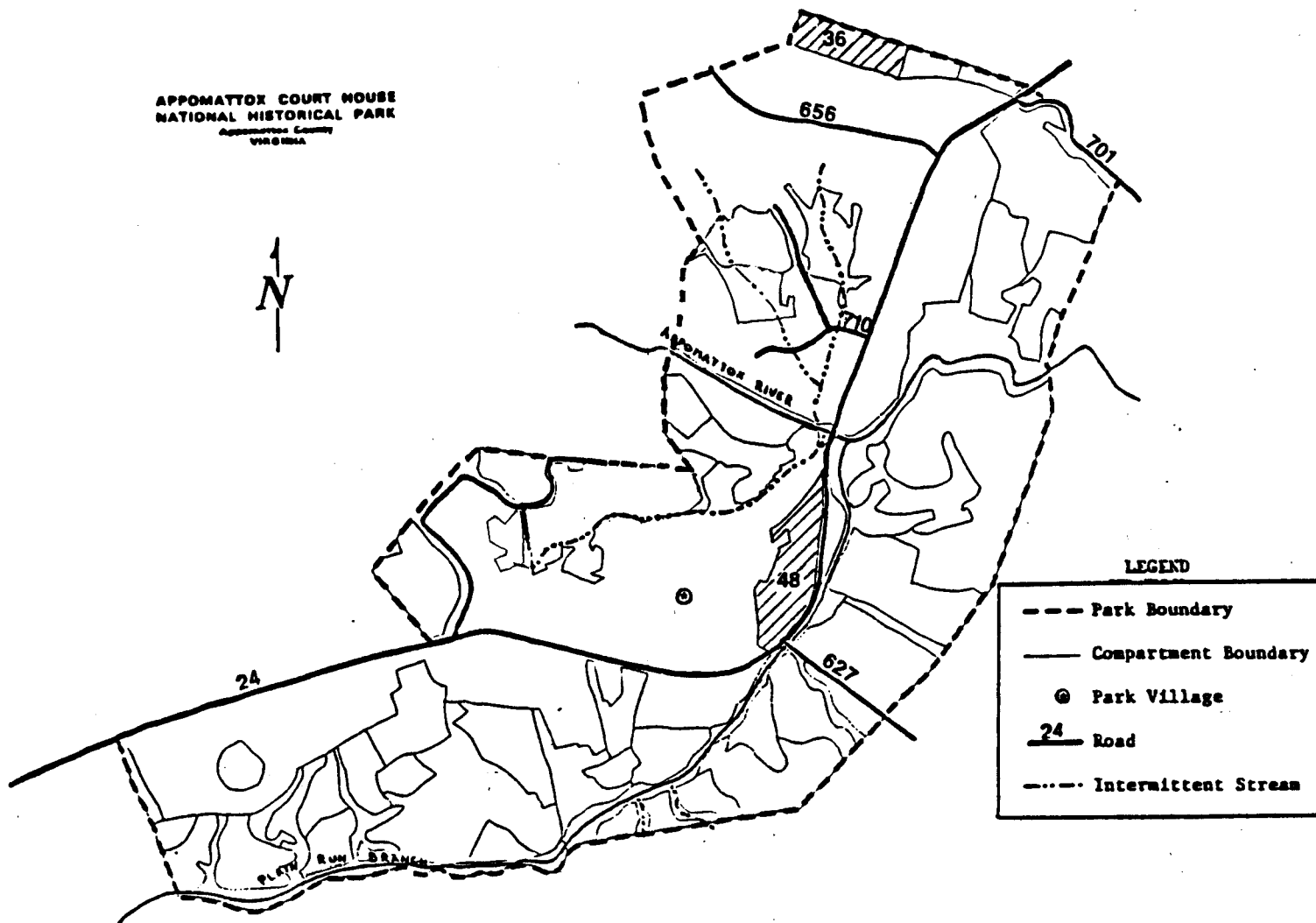


Figure 21: Location of Compartments 36 and 48 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

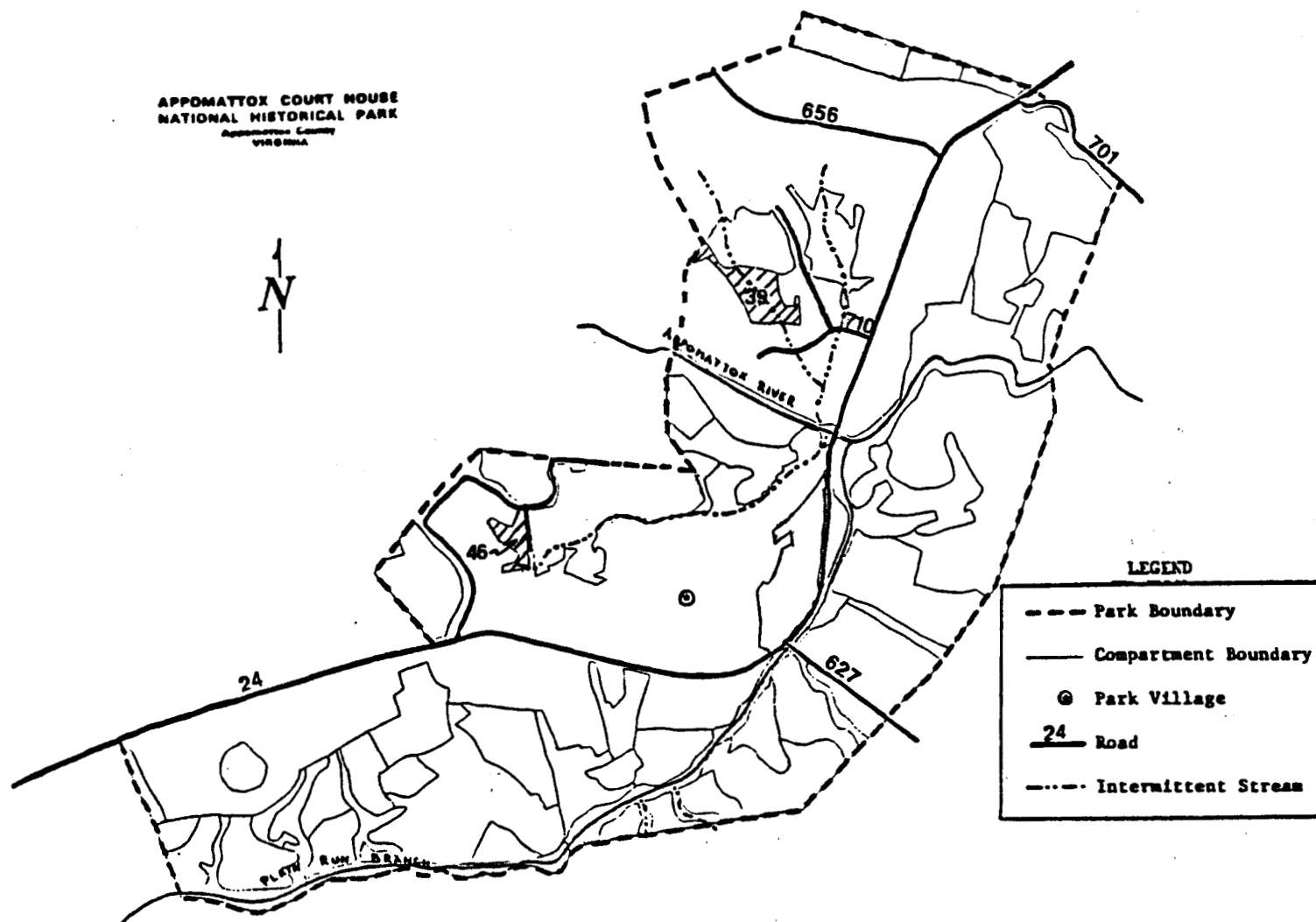


Figure 22: Location of Compartments 39 and 46 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Management Recommendation

As mentioned above, a mixed pine-hardwood composition for each of these compartments will create an adequate buffer; therefore, conversion to pure pine is not necessary. So, these compartments should be left alone and allowed to continue developing as they have been. However, once the average stand age for each of these compartments reaches 30 to 35 years, each compartment should be evaluated to determine whether a thinning is necessary. A thinning at that time, in which 40 to 45% of the total basal area is removed, would provide additional light within the stands to enhance the development of a vigorous hardwood understory.

### Future Stand Conditions

In 50 years, these four compartments will be composed of mixed hardwood-pine stands, with a mature pine component. Once the pine begins dying and falling out of these stands, it will be replaced by the more shade tolerant hardwoods. The thinning at age 30 to 35 years, would help to reduce the visual impact associated with the shift in forest cover types.

Stand Type F: Virginia Pine - Upland Hardwood

This stand type represents compartments with a mixture of Virginia pine and upland hardwoods. There is a total of 59 acres in this stand type, which is divided into five compartments (Compartments 7, 8, 15, 25 and 31).

Present Stand Conditions

Most of the Virginia pine within this stand type is overmature and suffering from wind and ice damage. Consequently, these stands are rapidly converting to a mixed upland hardwood type. The stocking is highly variable due to the blowdown. However, the average total basal area for the type is high at 110 square feet per acre (Table 7).

Approximately 55 percent of the total basal area is pine, with Virginia pine contributing 51 percent and shortleaf pine 4 percent (Table 7). The remaining 45 percent is composed of mixed hardwoods, the more prominent species being white oak and black oak. In the midstory stratum there is an average of 371 stems per acre. Over 50 percent of these stems are dogwood, but blackgum and hickory are also major components. The average total amount of regeneration is high, with a density of 8,260 stems per acre, and is well-distributed across the entire stand type. There are 17 different species found in the regeneration

Table 7. Summary of characteristics for the overstory, midstory and regeneration strata for the Virginia pine-Upland hardwood Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Acer rubrum</i>	1	1	15	4	1.00	578	7
<i>Amelanchier arborea</i>	-	-	-	-	-	83	1
<i>Carya</i> spp.	3	3	45	12	1.90	1487	18
<i>Cercis canadensis</i>	-	-	-	-	-	83	1
<i>Cornus florida</i>	7	6	197	53	2.25	2560	31
<i>Fagus grandifolia</i>	-	-	-	-	-	165	2
<i>Fraxinus</i> spp.	-	-	-	-	-	83	1
<i>Juniperus virginiana</i>	-	-	-	-	-	165	2
<i>Liriodendron tulipifera</i>	7	6	15	4	2.40	330	4
<i>Nyssa sylvatica</i>	3	3	70	19	1.44	578	7
<i>Pinus echinata</i>	4	4	-	-	-	-	-
<i>Pinus virginiana</i>	57	51	-	-	-	165	2
<i>Prunus serotina</i>	-	-	-	-	-	165	2
<i>Quercus alba</i>	15	13	-	-	-	1074	13
<i>Quercus coccinea</i>	1	1	-	-	-	-	-
<i>Quercus marilandica</i>	-	-	-	-	-	83	1
<i>Quercus phellos</i>	2	2	-	-	-	165	2
<i>Quercus rubra</i>	-	-	-	-	-	83	1
<i>Quercus velutina</i>	11	10	-	-	-	413	5
<i>Robinia pseudoacacia</i>	-	-	29	8	2.15	-	-
Totals	111	100	371	100	-	8260	100

1. The site quality index (base age 50 years) for this forest cover type is 73 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 65 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata found in the vertical structure of a forest: overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.



stratum. The three major components are dogwood, hickory, and white oak, in order of decreasing abundance.

#### Management Objective

Each compartment is an integral part of the forested buffer along the Park's perimeter. Therefore, it is imperative that these compartments be kept healthy to provide the most effective screens. It is also important to reduce the present fuel-loading conditions within these stands to decrease the current fire hazard.

#### Management Recommendation

The pine in this stand type is suffering severe decline from wind and ice damage. The number of hardwoods in the overstory has greatly increased over time due to the openings created by windthrown Virginia pine. With the hardwoods already occupying 45 percent of the basal area, this stand type is successfully shifting from a pine-dominated stand to a hardwood-dominated stand. To expedite this transition, any merchantable pines should be harvested before they suffer windthrow damage; however, no hardwoods should be harvested. All but 10 to 12 pine snags in each compartment should be felled and left lying on the forest floor to speed their decay. Disturbance in these

compartments should be minimized because of the amount and size of the hardwood regeneration.

#### Future Stand Conditions

This stand type is already in the advanced transition stage from Virginia pine to upland hardwood. In 50 years, this type will consist of maturing, mixed hardwood species. The oaks, primarily white and black, will dominate the overstory. However, there will also be several associated hardwood species such as beech, red maple, hickory and blackgum. There will be very little, if any, pine in the overstory because it will not be able to regenerate on the undisturbed forest floor.

There will also be bottomland hardwood species occurring on the more moist drainages within this stand type. The most common species in these bottomland sites will be red maple, beech, green ash, and yellow-poplar.

#### Compartments 7 and 8

##### Description and Location.

These compartments consist of a Virginia pine-upland hardwood mixture that is approximately 55- to 65-years-old. Compartment 7 is a 4-acre tract located on the Enon fine sandy loam and the Cullen loam soil series, and Compartment

8 is a 7-acre tract located on the Cullen and the Iredell loam series. Both compartments are found along the southern edge of the Park and are visible from Virginia State Route 24 (Figure 23). These compartments are accessible from the open fields adjacent to their northwestern edge. However, additional access will be provided via the new proposed road for this area of the Park. (See the discussion for the proposed road on pages 130 through 134.)

#### Compartment 15

##### Description and Location.

Compartment 15, a 17-acre Virginia pine-upland hardwood stand, is located near the North Carolina monument (Figure 24). This stand is easily accessible along its northern edge because it is bordered by open fields. In addition, Sears Lane runs along the eastern edge of this compartment. Portions of this compartment are visible from Virginia State Route 24.

This stand occurs almost entirely on the Iredell loam soil series. Therefore, all forest management activities within this compartment should be confined to dry periods during the year.

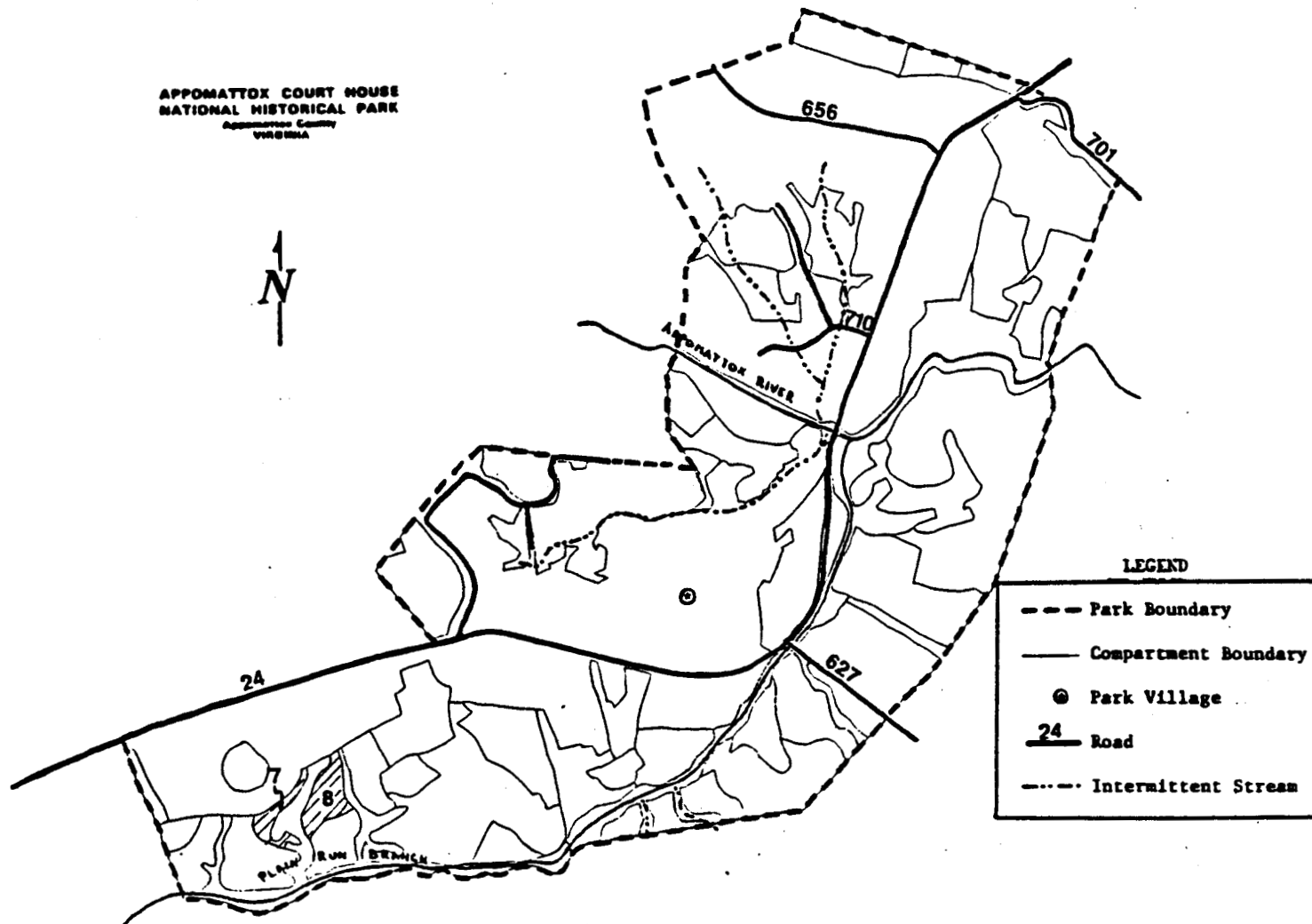


Figure 23: Location of Compartments 7 and 8 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

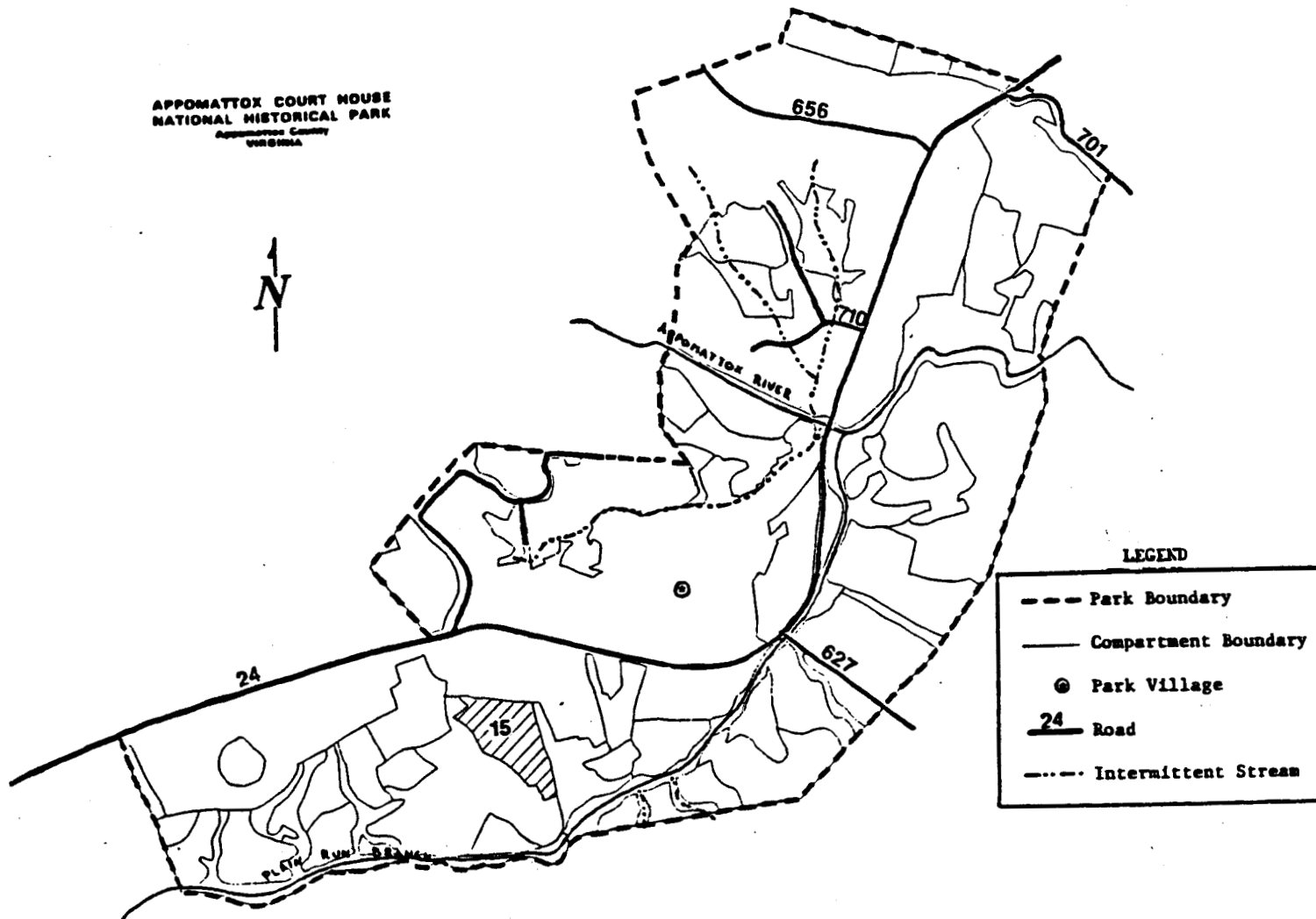


Figure 24: Location of Compartment 15 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Compartment 25

#### Description and Location.

Compartment 25 is a 14-acre Virginia pine-upland hardwood stand that is located along the southern boundary of the Park (Figure 25). The history/nature trail runs along the southeastern boundary of this compartment.

This compartment is located on three soil series. The Poindexter fine sandy loam is located on the slopes leading down to Plain Run Branch. Further up the slope, the Enon fine sandy loam and the Iredell loam series occur.

### Compartment 31

#### Description and Location.

Compartment 31 is a 17-acre compartment that is located along a knoll overlooking the Appomattox River (Figure 26). The history/nature trail runs through the middle of this compartment, thereby providing access to the stand. This compartment makes up a large portion of the eastern park boundary, providing a screen that reduces the visual impact resulting from recent, large clearcuts on land lying adjacent to the Park in this area.

The largest portion of the compartment is composed of gentle slopes on which the Georgeville silt loam series

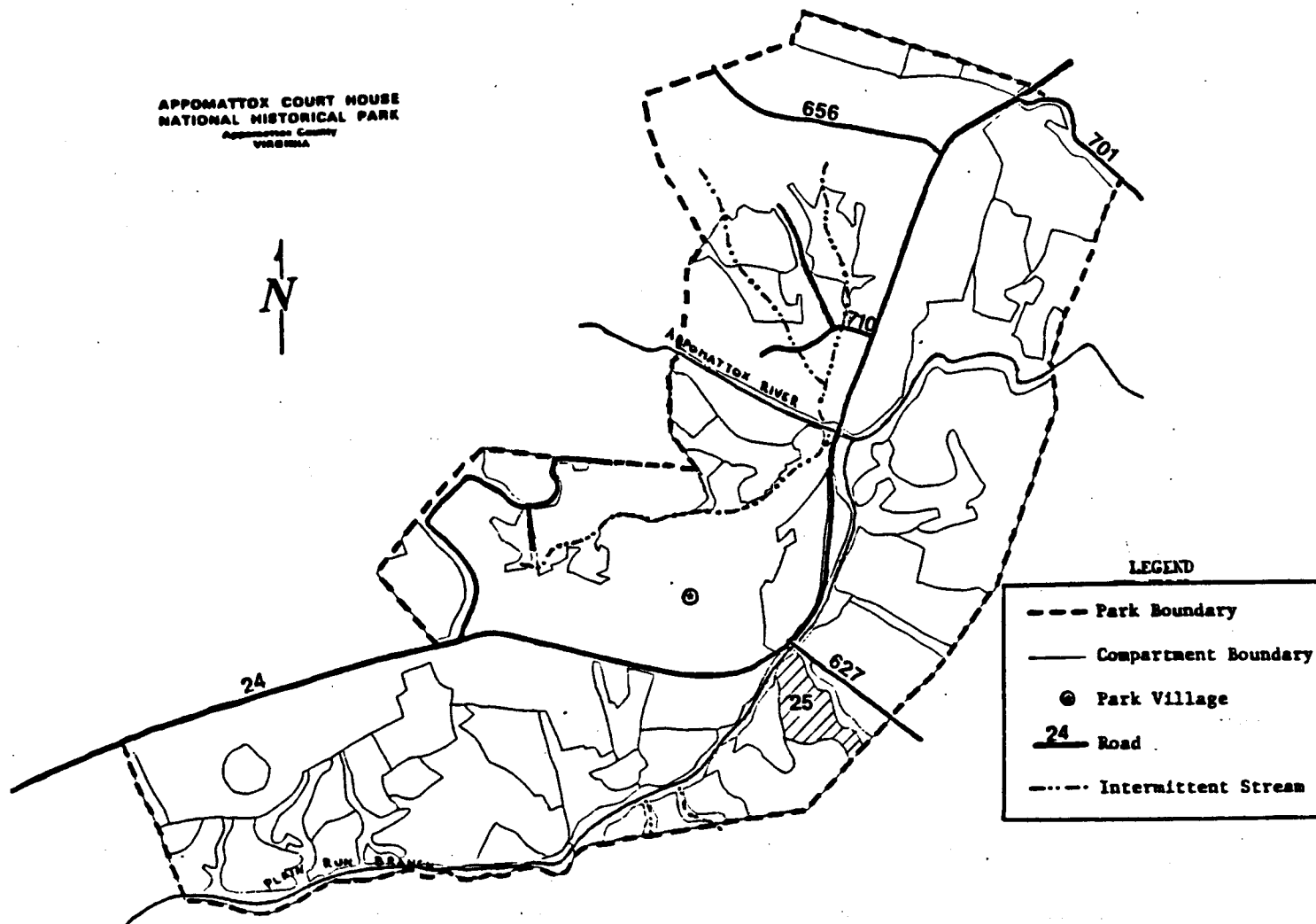


Figure 25: Location of Compartment 25 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

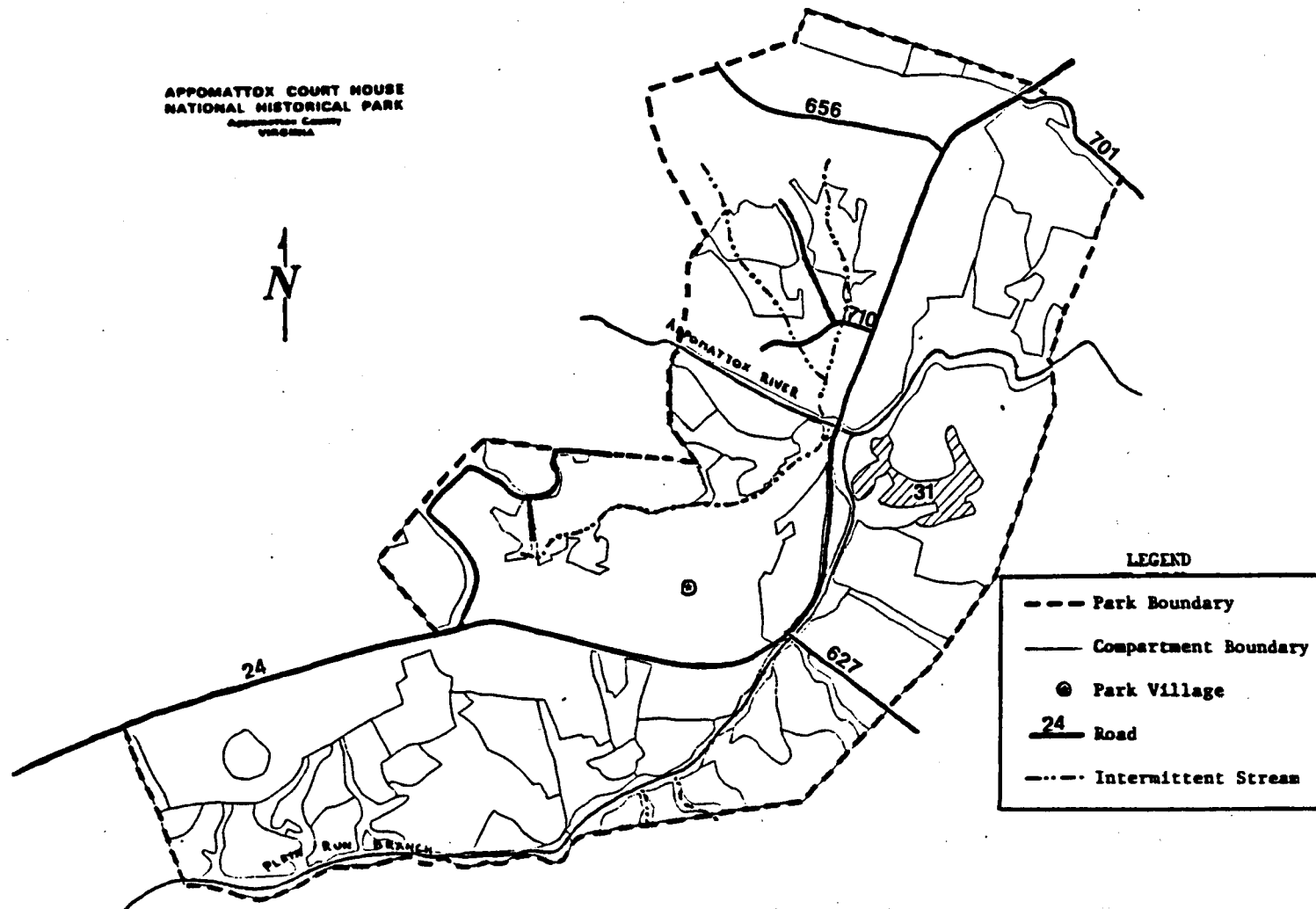


Figure 26: Location of Compartment 31 in the Appomattox Court House National Historical Park, Appomattox, Virginia.



occurs. The Poindexter fine sandy loam occurs along steep slopes (25% to 40% slope) in the compartment, while the Tatum silt loam soil series occurs in the drainages through which ephemeral<sup>10</sup> and intermittent streams flow into the Appomattox River.

Stand Type G: Grazed Virginia Pine - Upland Hardwood

This stand type represents those Virginia pine and upland hardwood stands which show evidence of past use by cattle. The total acreage of this type is 5 acres; it is represented by Compartment 6.

Present Stand Conditions

The stocking level in this stand type is low due to blowdown of the overmature Virginia pine. The average total basal area is fair, averaging 95 square feet per acre (Table 8). Over 50 percent of the total basal area is dogwood. Virginia pine and black cherry make up 21 and 11 percent of the basal area, respectively. As a result of grazing by cattle, there are no trees in either the midstory or the regeneration stratum. The soil beneath the forest canopy is exposed and severely compacted.

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<sup>10</sup> An ephemeral stream normally "flows during and for short periods following rain or snowmelt (Hewlett, 1982)."

Table 8. Summary of characteristics for the overstory, midstory and regeneration strata for the Grazed Virginia pine-Upland hardwood Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Species	Vertical Structure <sup>1</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Cornus florida</i>	50	53	-	-	-	-	-
<i>Fraxinus</i> spp.	5	5	-	-	-	-	-
<i>Liriodendron tulipifera</i>	5	5	-	-	-	-	-
<i>Pinus virginiana</i>	20	21	-	-	-	-	-
<i>Prunus serotina</i>	10	11	-	-	-	-	-
<i>Quercus coccinea</i>	5	5	-	-	-	-	-
Totals	95	100	0	0	-	0	0

1. There are three unique vegetation strata found in the vertical structure of a forest: overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.

## Compartment 6

### Description and Location.

Compartment 6 is a 5-acre, upland hardwood-Virginia pine stand that is 50- to 60-years-old. It is located in the middle of a pasture towards the the western edge of the Park, within view of Virginia State Route 24 (Figure 27). This compartment is located on the productive Cullen loam soil series.

### Management Objective.

This compartment has historical significance because it was known to be forested during the Civil War period. Therefore, it is important that this compartment be kept vigorous and healthy to ensure that it remains wooded to preserve the land-use pattern typical of that era.

### Management Recommendations.

This compartment is presently located in the middle of a pasture that is grazed by cattle. The presence of cattle in this compartment precludes the establishment of any regeneration on the forest floor. In addition, the compaction from the cattle is having a very detrimental effect on the overall integrity of the stand. The cattle must be excluded in order for advance regeneration to develop and to enhance the longevity of the overstory which is presently in a rapid state of decline.

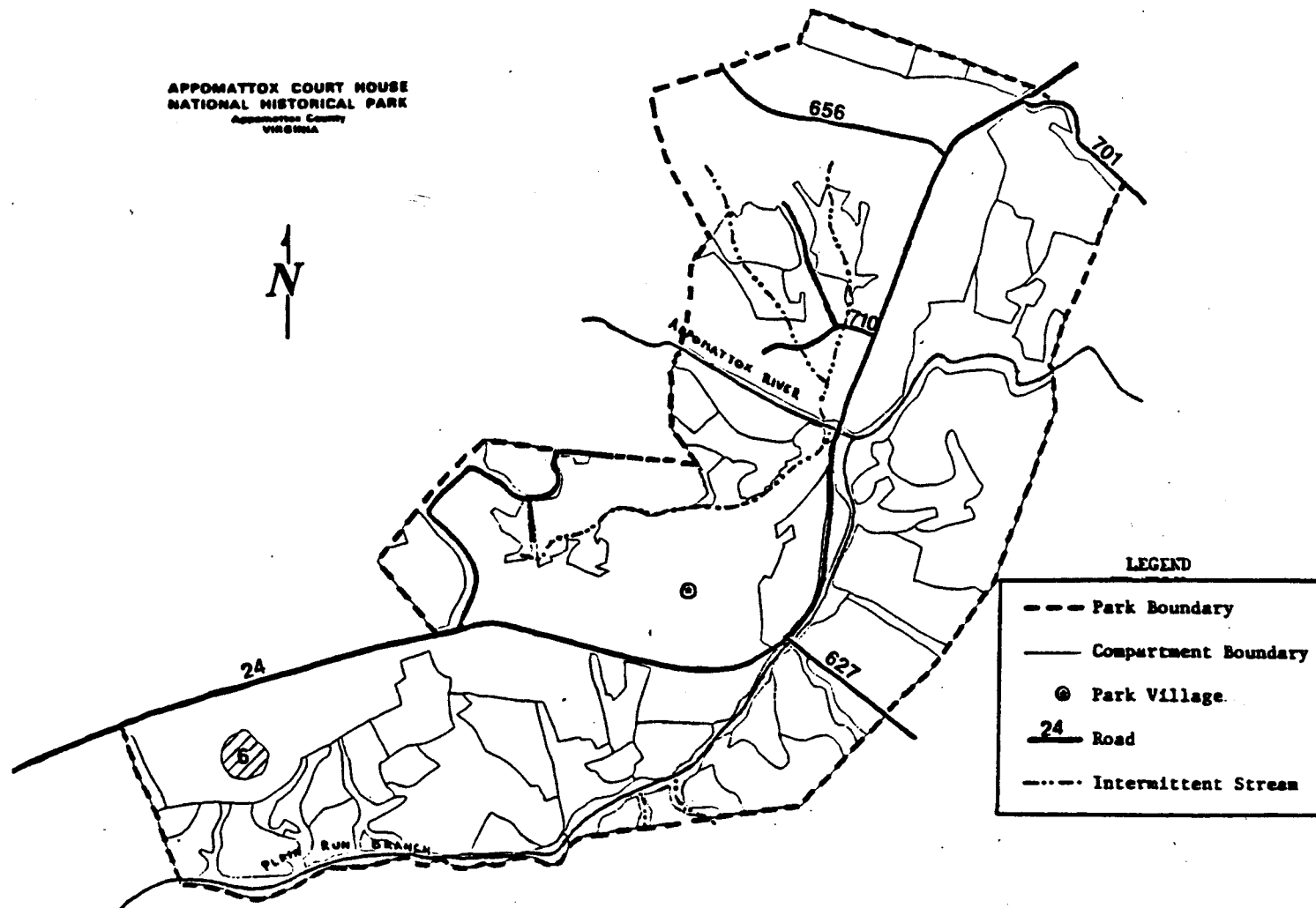


Figure 27: Location of Compartment 6 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

Most of the pines in this stand are overmature, and have suffered severe wind and ice damage. Because of the present declining condition, the stand has a very undesirable visual appearance. It is recommended that any remaining pines be felled as soon as possible and be allowed to lie on the forest floor if they cannot be salvaged. Decaying trees will provide some of the much needed organic matter for the forest floor.

Although this stand is poorly stocked, there is a diverse seed source available within the stand and in closeby stands for regeneration. Therefore, the openings created once the pines are felled will help the regeneration of green ash, yellow-poplar, black cherry, and scarlet oak. This regeneration may take up to 10 years to become well established because of the present stand conditions.

#### Future Stand Conditions.

In 50 years, this compartment will be an upland hardwood forest cover type. Pine will be absent from the interior of the stand; however, Virginia pine will develop along the open border of the stand next to the existing pasture. The major species in the overstory will be red maple, ash, scarlet oak, and black cherry. Dogwood will be the dominant midstory species.

Stand Type H: White Oak - Black Oak

This stand type represents all those stands which are composed of mixed upland hardwood species. The stands are presently in a relatively stable successional state, and will continue to be so for many years. There are five compartments which fall into this stand type designation (Compartments 14, 16, 30, 41 and 43) and total 111 acres.

Present Stand Conditions

This is a higher site-quality stand type than the White Oak - Chestnut Oak - Black Oak stand type (Stand Type I). The site index for the White Oak - Black Oak type is 73 feet for white oak (base age 50 years) and is reflected in the species composition. These stands are also better stocked with a total of 116 square feet of basal area per acre than are stands of the White Oak - Chestnut Oak - Black Oak type. Yellow-poplar is the most prominent species, occupying 28 percent of the total basal area (Table 9). It is followed in order by white oak, black oak, hickory and ash, comprising 16, 14, 14, and 12 percent, respectively. Common associates include beech, red maple, dogwood, Virginia pine and blackgum, in order of decreasing abundance. In the midstory stratum there is a total of 416 stems per acre. Of this total, 44 percent is composed of dogwood. The second

and third most common species found in the midstory stratum are white oak and hickory, respectively. Dogwood is also the most common species in the regeneration stratum, comprising 36 percent of the total 8,627 stems per acre. Willow oak, with 14 percent of the total number of stems, is the second most common species. Black oak and hickory are the third and fourth most common species, comprising 9 and 8 percent of the total, respectively. Many other species are found in the regeneration stratum including white oak, red maple, redbud, blackgum and Virginia pine, to name a few.

All five of the compartments within this stand type are located on deep, gently sloping, well-drained soils. Compartment 14, the 16-acre stand located near the North Carolina monument, is found on the Cullen loam and the Iredell loam soil series (Figure 28). Compartment 16, the 13-acre stand located just east of Sears Lane hiking trail, is found on both the Iredell loam and the Enon fine sandy loam soil series (Figure 29). Compartment 30, the 72-acre stand located on a knoll overlooking the Appomattox River, is found on the Georgeville silt loam and the Tatum silt loam soil series (Figure 30). No soils data have been collected for Compartment 41, a 7-acre stand located on the northwestern edge of the Park (Figure 31). Compartment 43, a 3-acre stand located on the northwestern boundary of the Park, is found on the Cullen loam series (Figure 32).

Table 9. Summary of characteristics for the overstory, midstory and regeneration strata for the White oak-Black oak Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Acer rubrum</i>	3	3	-	-	-	345	4
<i>Carpinus caroliniana</i>	-	-	-	-	-	86	1
<i>Carya</i> spp.	16	14	50	12	2.20	690	8
<i>Cercis canadensis</i>	-	-	33	8	1.20	345	4
<i>Cornus florida</i>	3	3	183	44	1.95	3106	36
<i>Fagus grandifolia</i>	6	5	17	4	3.10	173	2
<i>Fraxinus</i> spp.	14	12	-	-	-	86	1
<i>Juniperus virginiana</i>	-	-	-	-	-	173	2
<i>Liriodendron tulipifera</i>	34	28	-	-	-	259	3
<i>Nyssa sylvatica</i>	2	2	33	8	1.15	345	4
<i>Pinus virginiana</i>	3	3	-	-	-	345	4
<i>Quercus alba</i>	19	16	100	24	2.52	431	5
<i>Quercus phellos</i>	-	-	-	-	-	1208	14
<i>Quercus rubra</i>	-	-	-	-	-	86	1
<i>Quercus stellata</i>	-	-	-	-	-	173	2
<i>Quercus velutina</i>	16	14	-	-	-	776	9
Totals	116	100	416	100	-	8627	100

1. The site quality index (base age 50 years) for this forest cover type is 81 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 73 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata that makeup the vertical structure of a forest: the overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.



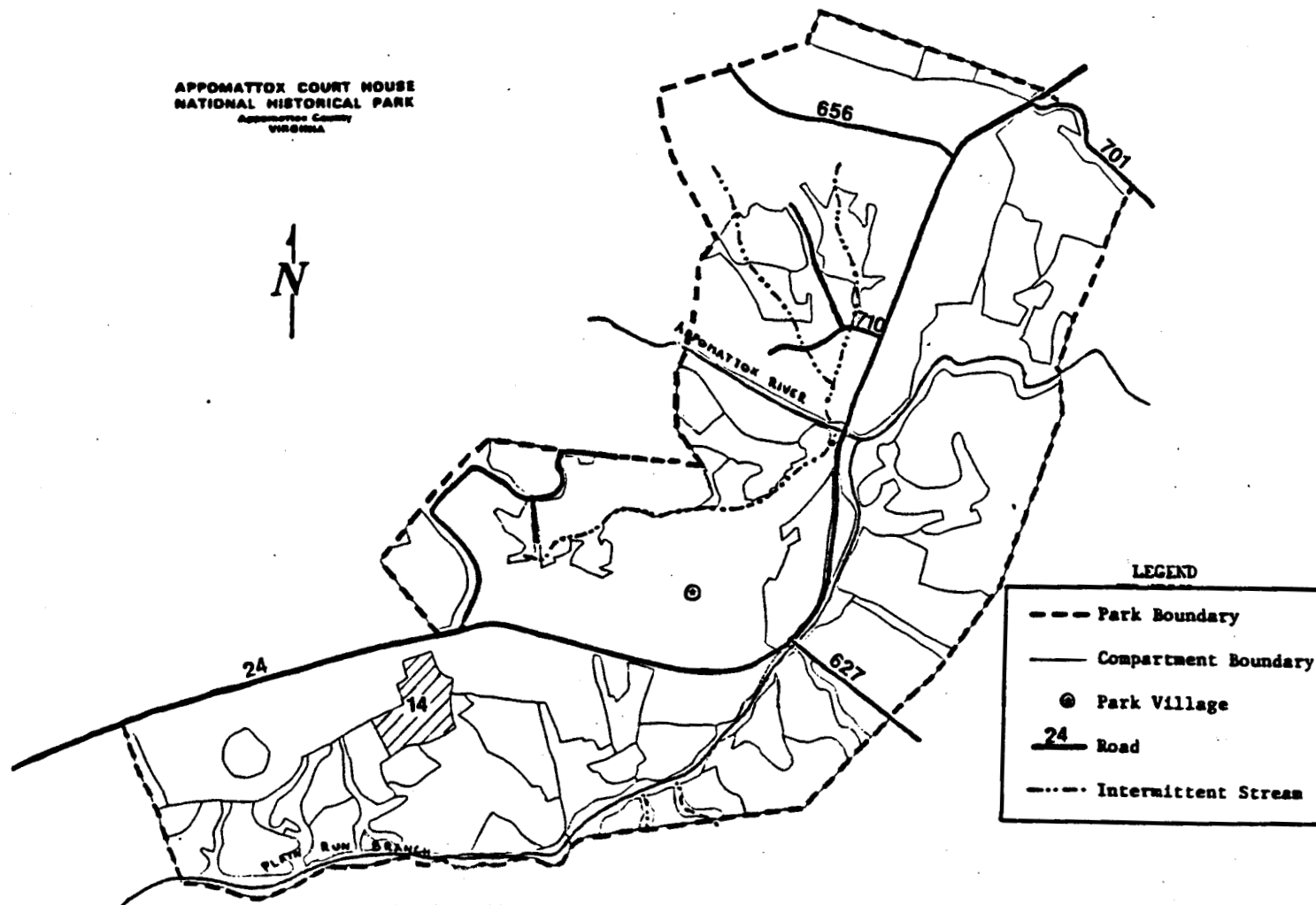


Figure 28: Location of Compartment 14 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

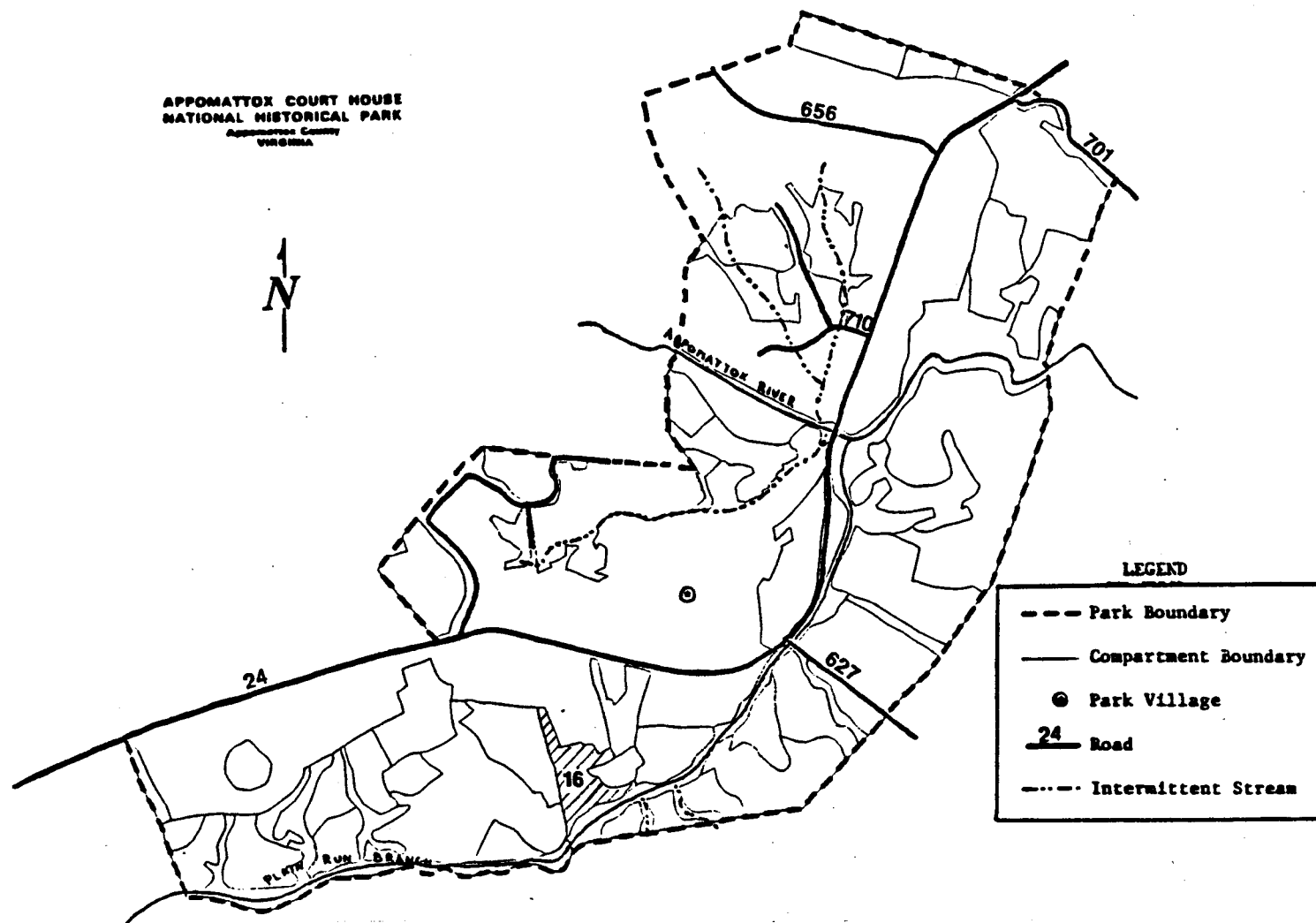


Figure 29: Location of Compartment 16 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

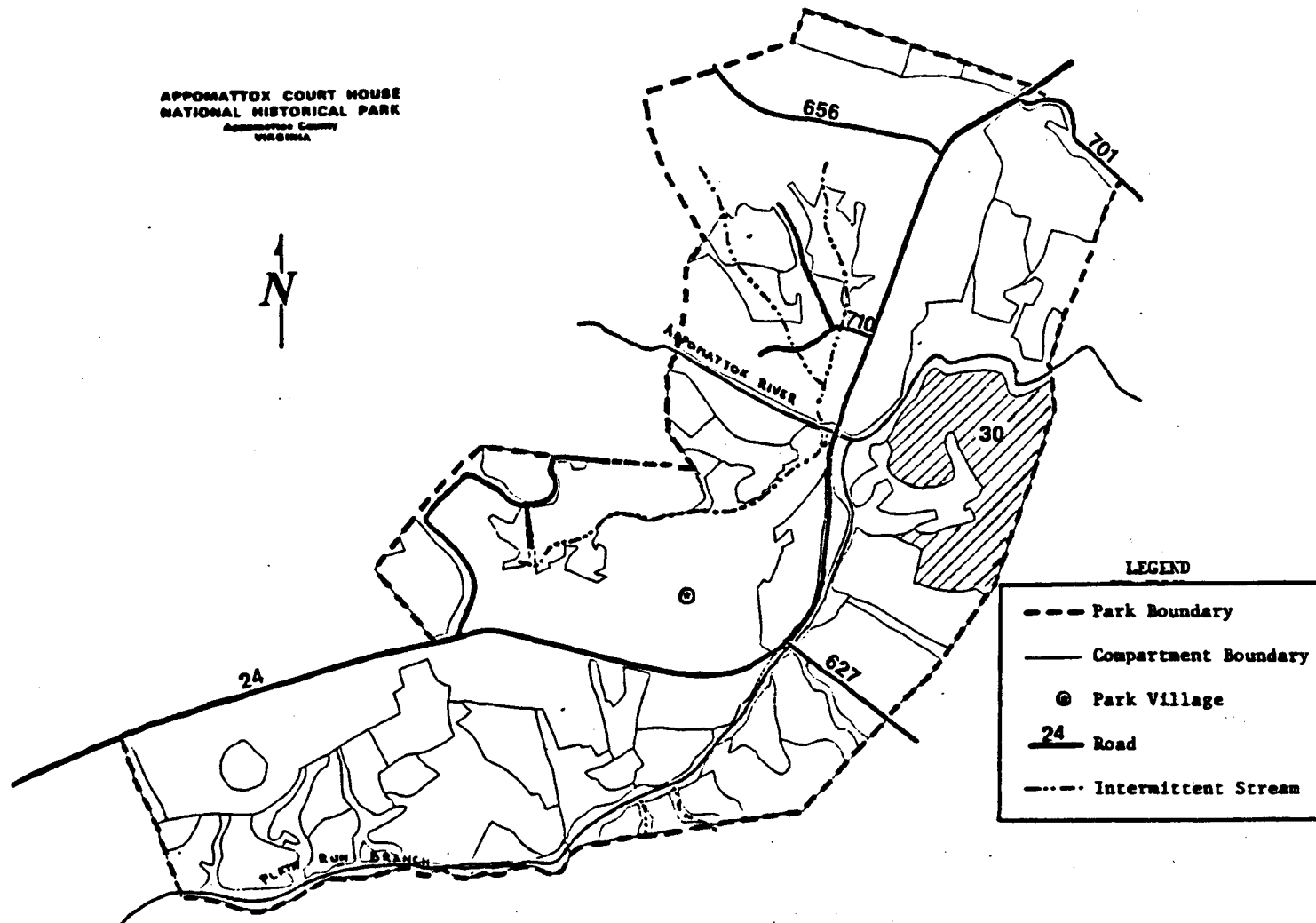


Figure 30: Location of Compartment 30 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

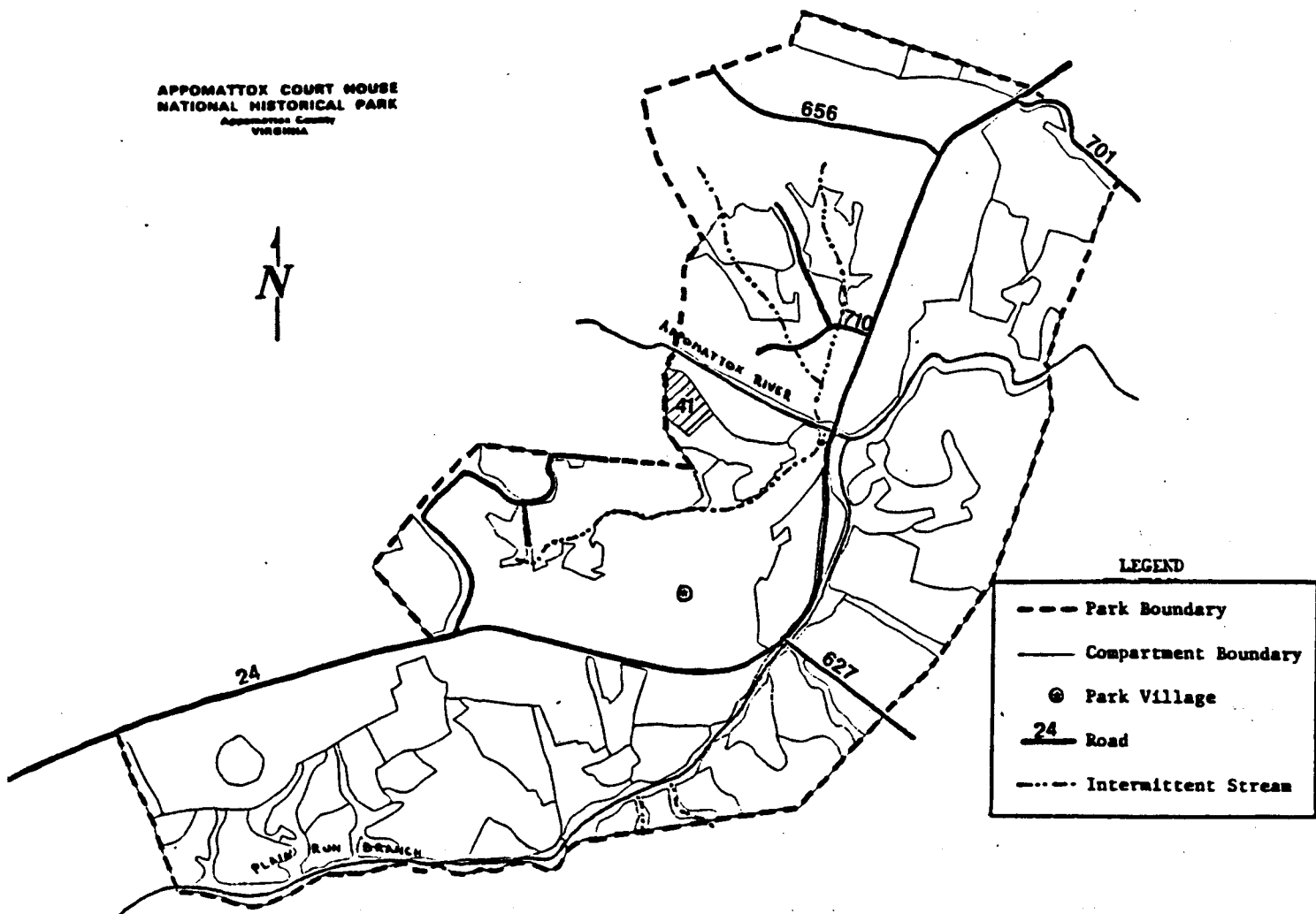


Figure 31: Location of Compartment 41 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

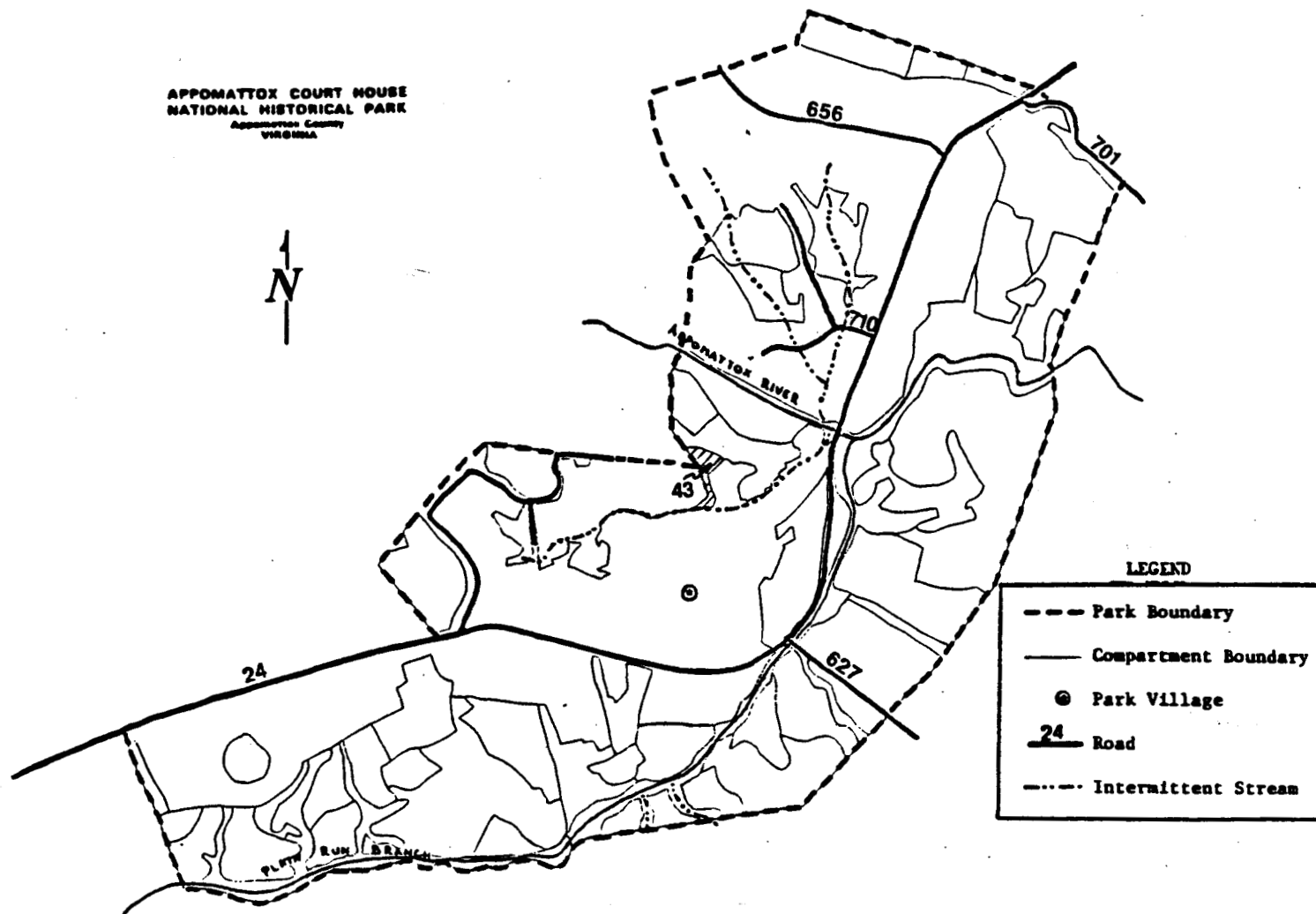


Figure 32: Location of Compartment 43 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Management Objective and Recommendation

Each of these five compartments must be maintained in a vigorous and healthy condition because they all contribute to the forested buffer around the Park's perimeter. Little forest management will be necessary, however, because each of these compartments is already in a relatively stable state, thereby requiring minimal attention to maintain healthy stands. However, should the gypsy moth become a serious problem in this part of the state, forest management activities in these compartments will need to be modified. (Appendix C contains information concerning the gypsy moth.) Until that time, though, the primary forest management recommendation for these compartments is to conduct sanitation and salvage cuts as necessary to maintain the historical aspects, visitor safety and visual amenities of these stands.

### Future Stand Conditions

In 50 years, this upland hardwood stand type will be much the same as it is today. The oaks and hickories will continue to be the most prominent species in the stand. Beech and red maple will begin to occupy a larger portion of the total basal area over time because they are more shade tolerant than the oaks and hickories and are more capable of

regenerating beneath the shade of the hardwood canopy than the oaks and hickories. The pine, however, are relatively intolerant of shade. Therefore, over time, the pine component within this stand type will become less and less significant, until it finally becomes non-existent, except in openings that may occur and along the stand perimeter next to open fields.

Stand Type I: White Oak - Chestnut Oak - Black Oak

This stand type represents all those stands which are composed of a mixture of lower-quality, upland hardwood species. The stands are presently in a relatively stable, advanced, successional state, and will continue to exhibit only minor changes in the next 30 to 50 years. There are three compartments, totalling 78 acres, which fall into this stand type designation (Compartments 23, 33 and 47).

Present Stand Conditions

The White Oak - Chestnut Oak - Black Oak Stand Type is less productive than the White Oak - Black Oak stand type with a site index averaging 60 to 65 feet for white oak (base age 50 years). Of the 98 square feet of basal area per acre, white oak is the dominant species, comprising 31 percent of the total (Table 10). Chestnut oak and black oak

comprise 14 and 12 percent, respectively. Red maple, hickory, yellow-poplar and blackgum are some of the more common associates of the oaks in this stand type. A total of 400 stems per acre were found for the midstory stratum. Dogwood comprises 69 percent of the total number of stems, followed by blackgum which comprises 19 percent. A total of 8,586 stems per acre were found in the regeneration stratum. Of this total, dogwood and white oak are two of the most common species, comprising 64 and 12 percent of the total, respectively.

For the most part, all of the soils underlying each of the compartments in this stand type are deep, gently sloping, and well-drained. Compartment 23, a 23-acre stand located along the southern border of the Park, is found on the Enon fine sandy loam and the Cullen loam soil series (Figure 33). Compartment 33, a 36-acre stand located along the northeastern border of the Park (near Lee's headquarters), is found on the Georgeville and the Tatum silt loam series (Figure 34). No soils data have been assimilated for Compartment 47 which is a 19-acre stand located adjacent to Virginia State Route 24 towards the western edge of the Park (Figure 35).



Table 10. Summary of characteristics for the overstory, midstory and regeneration strata for the White oak-Chestnut oak-Black oak Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Acer rubrum</i>	8	8	24	6	1.60	172	2
<i>Carya</i> spp.	8	8	-	-	-	687	8
<i>Cornus florida</i>	4	4	276	69	1.43	5495	64
<i>Liriodendron tulipifera</i>	6	6	24	6	1.40	172	2
<i>Nyssa sylvatica</i>	6	6	76	19	1.90	172	2
<i>Pinus echinata</i>	2	2	-	-	-	-	-
<i>Pinus virginiana</i>	4	4	-	-	-	86	1
<i>Quercus alba</i>	32	31	-	-	-	1030	12
<i>Quercus coccinea</i>	4	4	-	-	-	86	1
<i>Quercus prinus</i>	13	14	-	-	-	343	4
<i>Quercus velutina</i>	12	12	-	-	-	343	4
Totals	98	100	400	100	-	8586	100

1. The site quality index (base age 50 years) for this forest cover type is 64 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 57 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata that makeup the vertical structure of a forest: the overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.

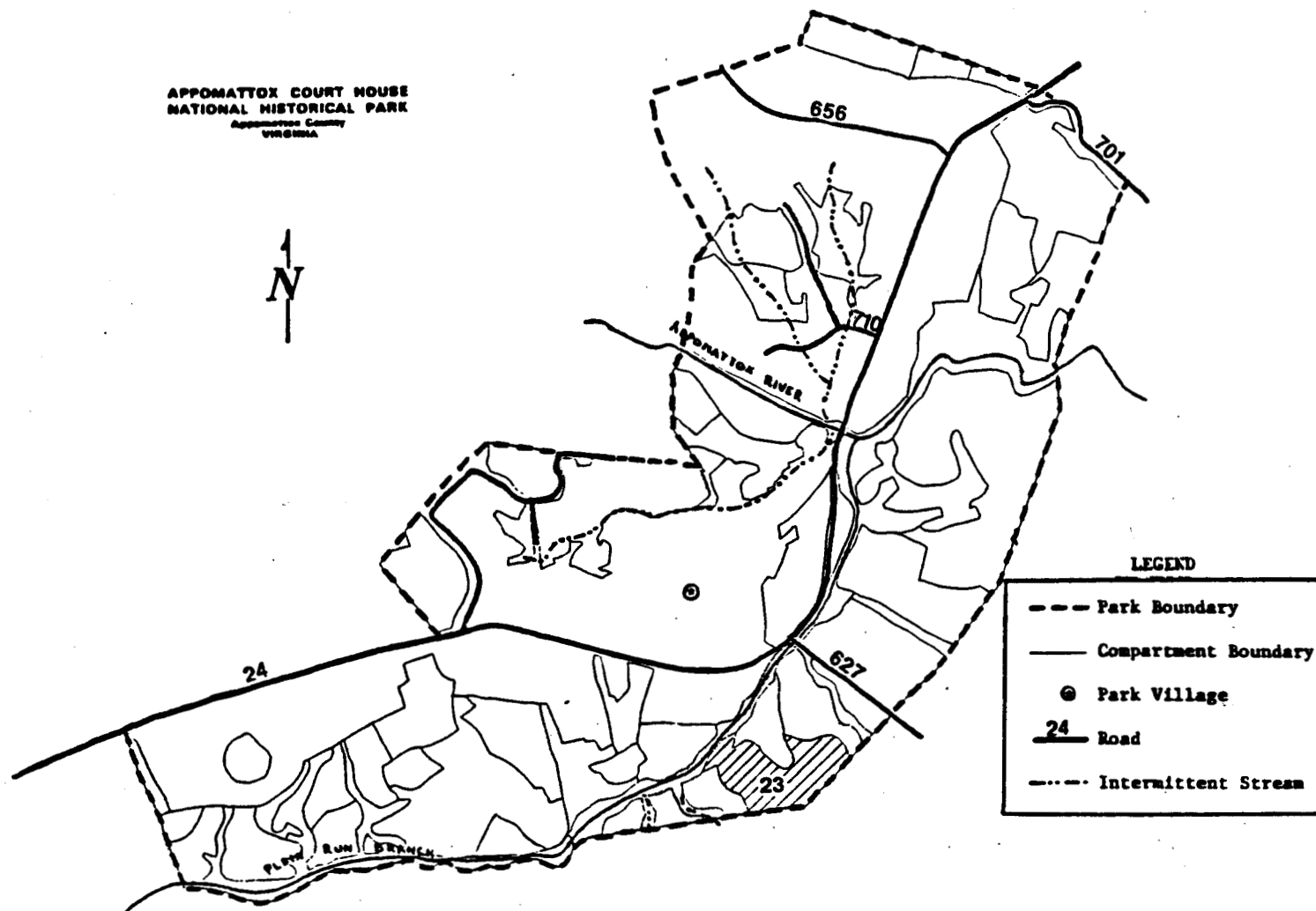


Figure 33: Location of Compartment 23 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

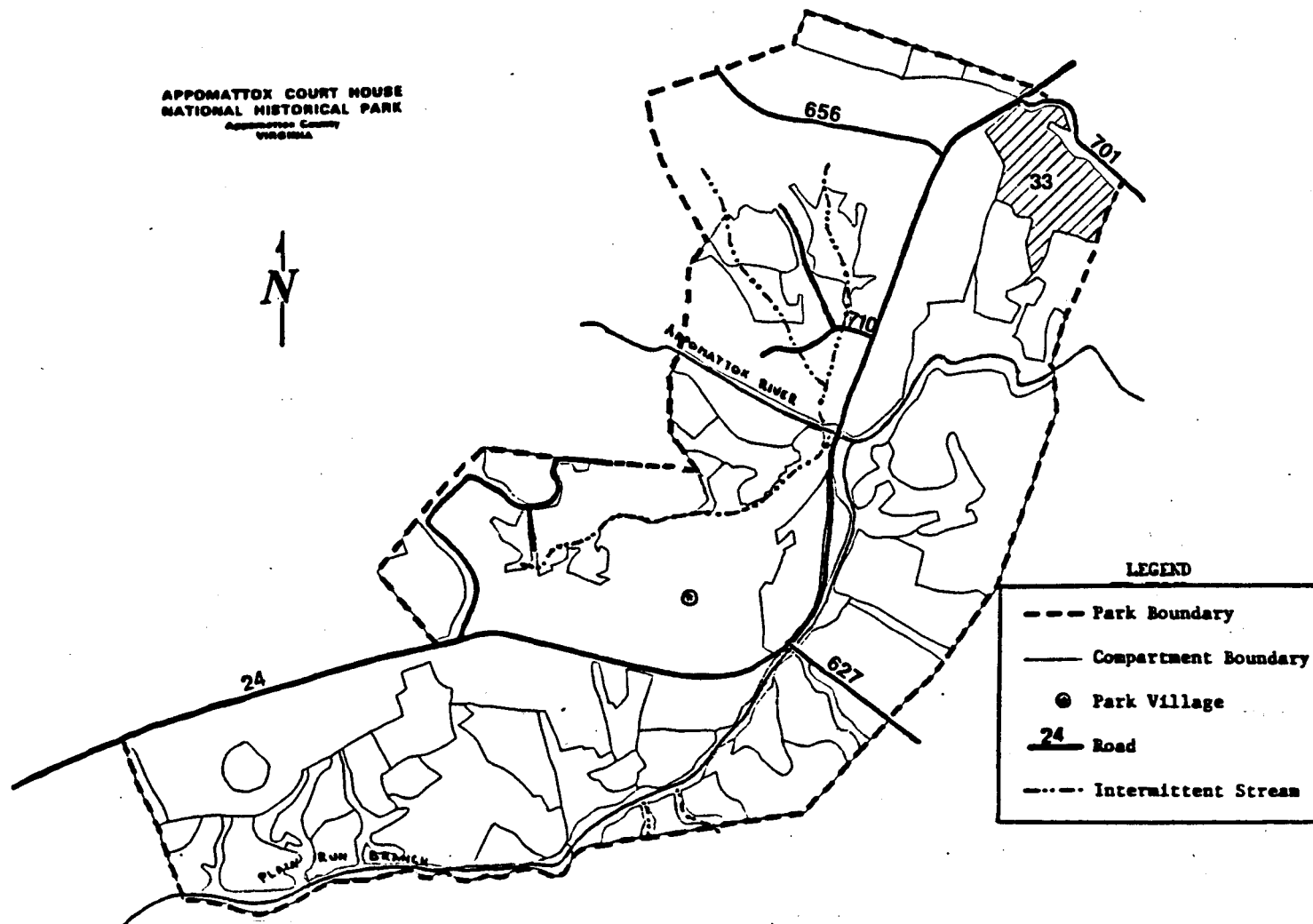


Figure 34: Location of Compartment 33 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

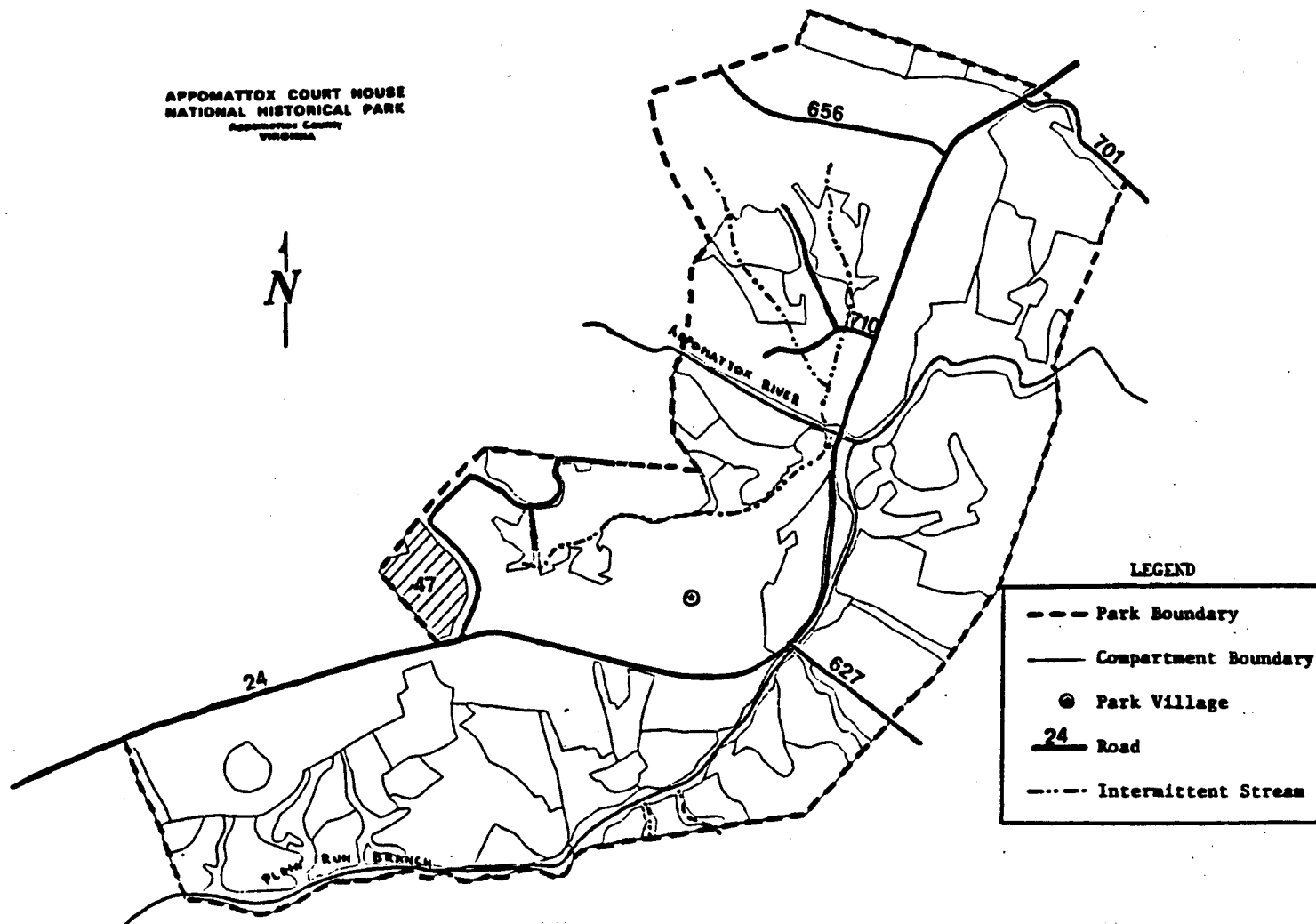


Figure 35: Location of Compartment 47 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Management Objective and Recommendation

The three compartments comprising the White Oak - Chestnut Oak - Black Oak stand type will be managed in the same manner as the compartments of the White Oak - Black Oak type. Little forest management will be necessary, however, because each of these compartments is already in a relatively stable state, thereby requiring minimal attention to maintain healthy stands. However, should the gypsy moth become a serious problem in this part of the state, forest management activities in these compartments will need to be modified. (Appendix C contains information concerning the gypsy moth.) Until that time, though, the primary forest management recommendation for these compartments is to conduct sanitation and salvage cuts as necessary to maintain the historical aspects, visitor safety and visual amenities of these stands.

### Future Stand Conditions

In 50 years, the White Oak - Chestnut Oak - Black Oak Stand Type, like the White Oak - Black Oak type, will look much the same as it does today. The oaks and hickories will continue to be the prominent species; however, the beech and red maple will become more prevalent over time because of their shade tolerance, while the pines will occupy a smaller

and smaller portion of the total basal area because of their shade intolerance. (A more complete discussion of these future stand conditions is found in the White Oak - Black Oak section on pages 110 and 111.)

#### Stand Type J: Bottomland Hardwood

Stand type J represents compartments containing a mixture of bottomland hardwood species. Each of the four compartments in this stand type (Compartments 4, 17, 27 and 40) is located along a perennial or an intermittent stream. Therefore, cutting of timber in these compartments is not recommended. The total acreage for this stand type is 126 acres.

#### Present Stand Conditions

Most of the compartments in the Bottomland Hardwood stand type are located along perennial waterways such as the Appomattox River and Plain Run Branch; however, some are found along intermittent and ephemeral streams (Figure 36). For the most part, each of the four compartments in this stand type have the same present stand conditions as well as soil types; therefore, all four will be discussed as a group.

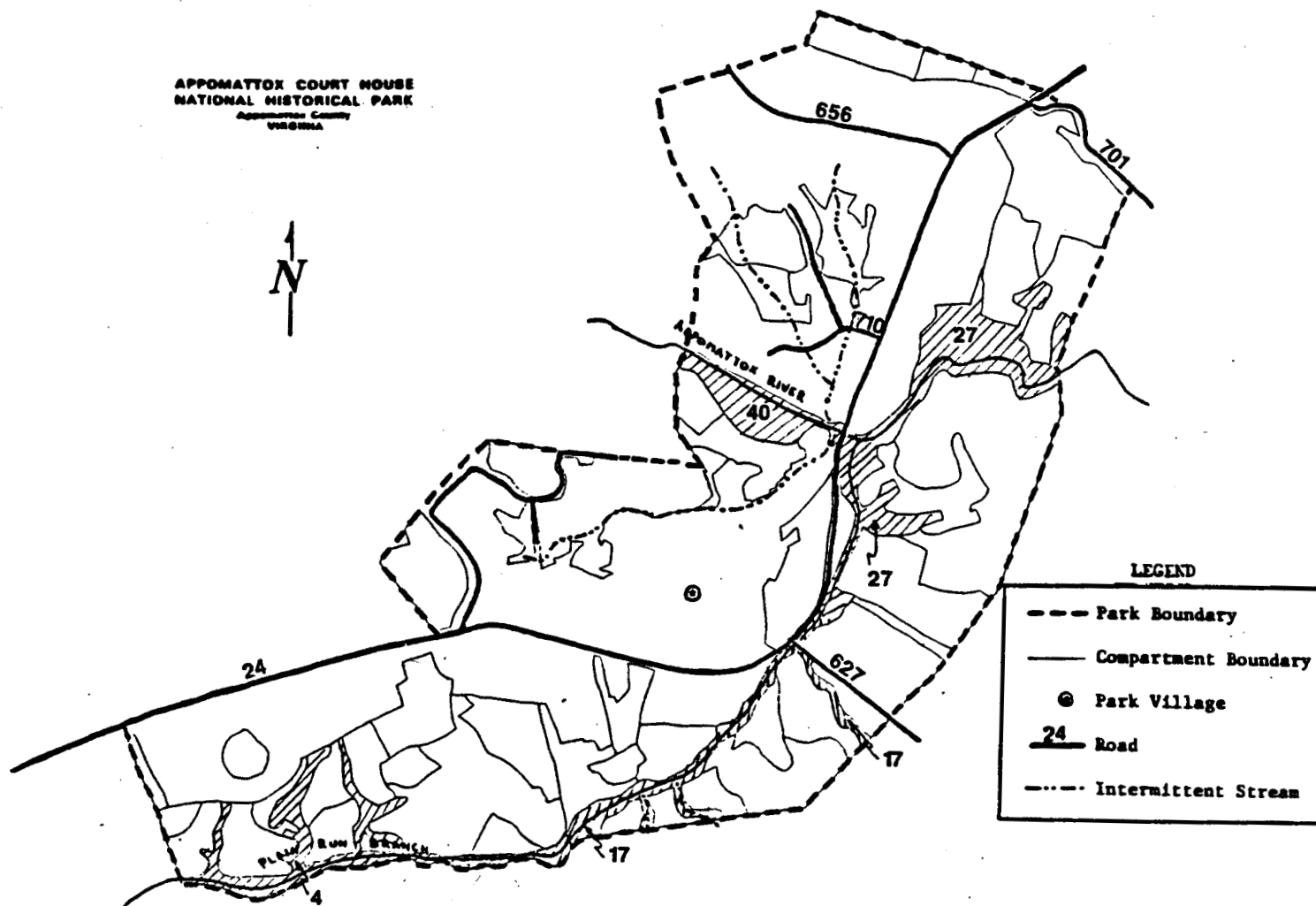


Figure 36: Location of the Bottomland Hardwoods in the Appomattox Court House National Historical Park, Appomattox, Virginia.

There is presently 133 square feet of basal area per acre in each compartment. On the average, 54 percent of the basal area consists of yellow-poplar, while 36 percent consists of red maple. Elm species, black walnut, Virginia pine, and beech combined make up the remaining 10 percent of the basal area (Table 11). In the midstory, dogwood, red maple and redbud are the three most prominent species. These species in combination with black walnut and hickory comprise the total 350 stems per acre. The regeneration stratum, on the average, has 5,227 stems per acre. Dogwood and blackgum are the most prominent species in this stratum. Downy serviceberry, ash, black cherry, hazel alder and white oak each contribute about 6 percent of the total number stems per acre.

The four compartments tend to fall on floodplain soils which are almost always deep and nearly level, such as the Worsham fine sandy loam, Congaree silt loam, Poindexter fine sandy loam, Starr loam and the Chewacla silt loam soil series. The Starr loam, Congaree silt loam and the Poindexter fine sandy loam are all well-drained or moderately well-drained; however, the Chewacla silt loam and the Worsham fine sandy loam are both prone to ponding because they are poorly drained.



Table 11. Summary of characteristics for the overstory, midstory and regeneration strata for the Bottomland hardwood Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.<sup>1</sup>

Species	Vertical Structure <sup>2</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Amelanchier arborea</i>	-	-	-	-	-	366	7
<i>Acer rubrum</i>	48	36	53	15	2.30	104	2
<i>Alnus serrulata</i>	-	-	-	-	-	261	5
<i>Carya</i> spp.	-	-	24	7	1.10	209	4
<i>Cercis canadensis</i>	-	-	49	14	1.30	209	4
<i>Cornus florida</i>	-	-	200	57	1.66	1987	38
<i>Fagus grandifolia</i>	3	2	-	-	-	-	-
<i>Fraxinus</i> spp.	-	-	-	-	-	314	6
<i>Juniperus virginiana</i>	-	-	-	-	-	104	2
<i>Liriodendron tulipifera</i>	71	54	-	-	-	-	-
<i>Myssa sylvatica</i>	-	-	-	-	-	1098	21
<i>Pinus virginiana</i>	3	2	-	-	-	-	-
<i>Prunus serotina</i>	-	-	-	-	-	314	6
<i>Quercus alba</i>	-	-	-	-	-	261	5
<i>Robinia pseudoacacia</i>	3	2	-	-	-	-	-
<i>Ulmus</i> spp.	5	4	-	-	-	-	-
Totals	133	100	350	100	-	5227	100

1. The site quality index (base age 50 years) for this forest cover type is 85 for Virginia pine (Nelson, Clutter and Chaiken, 1961), and 78 for white oak (Doolittle, 1958).

2. There are three unique vegetation strata that makeup the vertical structure of a forest: the overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.

### Management Objective

These bottomland hardwood compartments will be managed to provide a buffer strip to help filter sediment from any overland flow which might result from proposed forestry management operations occurring uphill from the streams. Buffer strips are also necessary to maintain inherent temperature norms in the streams and river as required by the Virginia State Water Control Board (1979).

### Management Recommendation

Considering the stable condition of this stand type, no intensive management activities are necessary. As long as these compartments are left as they are, they will continue to act as excellent filter strips for the waterways flowing through the Park.

### Future Stand Conditions

Due to the relatively stable condition of the Bottomland Hardwood Stand Type, its future stand conditions will not significantly differ from its present stand conditions. The only noticeable difference will be the greater amount of beech and red maple in these compartments in 50 years, compared to that which is present now. Both of these species are very shade tolerant; therefore, they will become even more prevalent in this stand type over time.

Stand Type K: Grazed Red Maple - Mixed Hardwood

This stand type represents those hardwood stands which show evidence of past use by cattle. There are two compartments (Compartments 18 and 37), totalling 23 acres, which fit this description.

Present Stand Conditions

This stand type represents mixed hardwood stands in which cattle have had full access. These stands are presently somewhat understocked with 98 square feet of basal area per acre (Table 12). Of this total, 48 percent is red maple, 14 percent is black walnut, and 13 percent is willow oak. The remaining 25 percent is composed of a mixture of typically moist site species (Table 12). The average age of these overstory trees is between 50 and 60 years.

Due to severe soil compaction from overuse of the area by cattle, the midstory stratum is very limited in number of stems (150 stems per acre) and species diversity. Red maple, hornbeam and ash were each equally represented in the stand, with an average of 50 stems per acre. There were no stems in the regeneration stratum.

Table 12. Summary of characteristics for the overstory, midstory and regeneration strata for the Grazed Red Maple-Mixed Hardwood Stand Type located on the Appomattox Court House National Historical Park, Appomattox, Virginia.

Species	Vertical Structure <sup>1</sup>						
	Overstory		Midstory			Regeneration	
	Basal Area (ft <sup>2</sup> /ac)	Percent of Total (%)	Stems (no./ac)	Percent of Total (%)	Mean DBH (in)	Stems (no./ac)	Percent of Total (%)
<i>Acer rubrum</i>	48	47	50	33	5.00	-	-
<i>Carpinus caroliniana</i>	3	3	50	33	3.60	-	-
<i>Carya</i> spp.	3	3	-	-	-	-	-
<i>Fraxinus</i> spp.	8	8	50	33	2.80	-	-
<i>Juglans nigra</i>	14	14	-	-	-	-	-
<i>Juniperus virginiana</i>	3	3	-	-	-	-	-
<i>Liriodendron tulipifera</i>	5	5	-	-	-	-	-
<i>Nyssa sylvatica</i>	3	3	-	-	-	-	-
<i>Quercus phellos</i>	13	12	-	-	-	-	-
Totals	98	100	150	100	-	0	100

1. There are three unique vegetation strata that makeup the vertical structure of a forest: the overstory, midstory, and regeneration. The overstory strata is composed of those individuals which make up the main canopy of the stand. The midstory strata includes those individuals which are not large enough to be a part of the canopy, but are too large to be considered a part of the regeneration. The regeneration strata is comprised of individuals which are less than four feet in height.

Compartment 18Description and Location.

Compartment 18, a 9-acre mixed hardwood stand, is located directly across from the Park village, adjacent to Virginia State Route 24 (Figure 37). Access to this stand is very good since the entire compartment is surrounded by open fields.

Cows are presently allowed in this compartment; therefore, the soil within this compartment is severely compacted. The majority of the compartment occurs on the Iredell loam soil series, and is thus moderately well-drained. However, portions of the compartment occur on the Worsham fine sandy loam soil series and are somewhat swampy.

Management Objective and Recommendation.

Compartment 18 is historically significant because it was forested during the Civil War period. It is therefore important that this compartment be kept in a vigorous and healthy condition to ensure that it remains wooded. Consequently, it is best to fence the cattle out of this stand; continued use will only further aggravate the current problem of soil compaction, thereby severely reducing the successful establishment of any regeneration, and accelerating the decline of the main forest canopy.

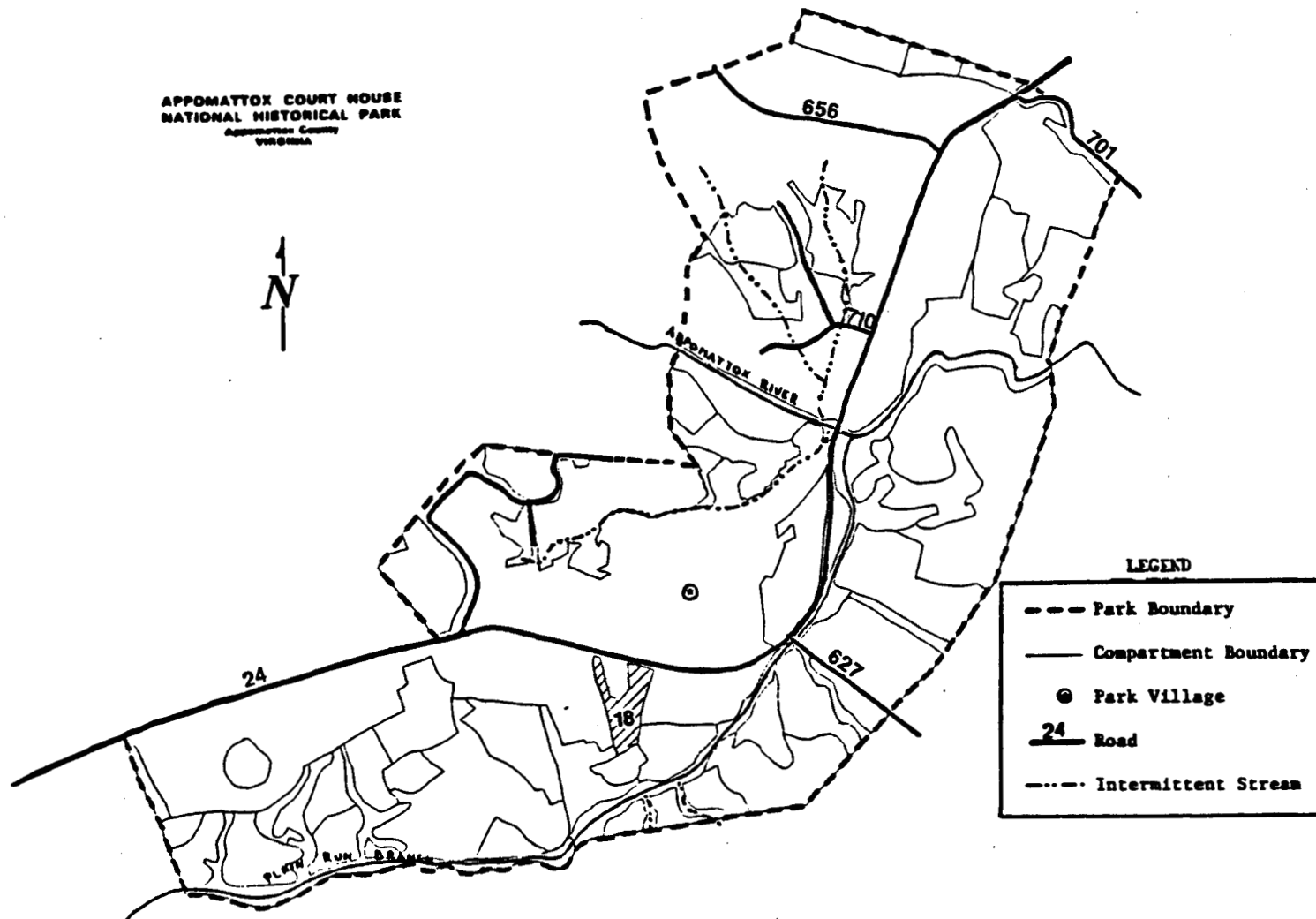


Figure 37: Location of Compartment 18 in the Appomattox Court House National Historical Park, Appomattox, Virginia.

### Future Stand Conditions.

Assuming that the cattle are fenced out of this compartment, it will take from 5 to 8 years before any significant amount of regeneration becomes established. In 50 years, this stand will consist of species typical of moist sites, such as red maple, black walnut and willow oak.

### Compartment 37

#### Description and Location.

This 14-acre compartment of mixed hardwood is located just beyond the intersection of Route 710 and Virginia State Route 24, and it is easily accessible (Figure 38). An intermittent stream flows through this stand and into the Appomattox River. Presently, cattle are excluded; however, past abuse from cattle is still evident because there is little or no regeneration in this compartment, and the soil appears to be compacted. There are no soils data available for this compartment because this portion of the Park was purchased after the soils map was prepared for the Park in 1976.

#### Management Objective and Recommendation.

This stand has no historical significance; however, because it is located on an intermittent stream, it is best to assure that this compartment remains wooded. Therefore,

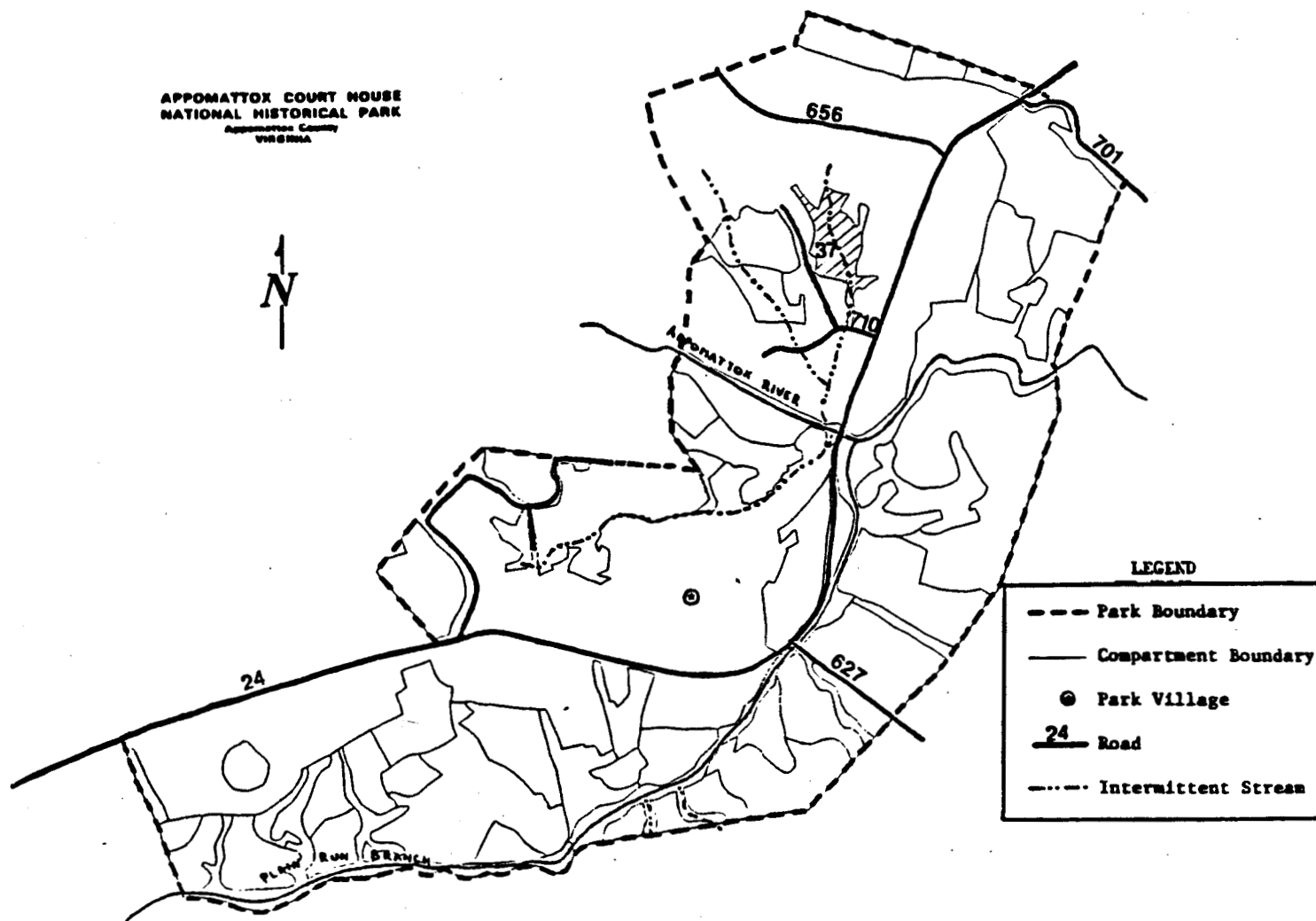


Figure 38: Location of Compartment 37 in the Appomattox Court House National Historical Park, Appomattox, Virginia.



cattle must continue to be excluded. This should pose no problem since there is already a fence which surrounds most of this compartment.

Depending upon the amount of soil compaction, the canopy density (amount of light reaching the forest floor), and the type of species, regeneration should begin to appear within 10 to 20 years.

Future Stand Conditions.

In 50 years, the major species occupying Compartment 37 will be red maple, beech and ash because these species are capable of regenerating beneath a closed canopy. There will also be a small component of yellow-poplar in this compartment because it will invade any openings caused by the death (and subsequent removal) of older trees in the main canopy.

## PROPOSED ROAD

For the most part, the present history/nature trail provides ample access to the forested stands along the eastern and southeastern portions of the Park. However, this trail does not extend the full length of the Park; it ends just beyond the North Carolina monument. Consequently, the woodlands from this monument to Grant's headquarters are relatively inaccessible. This poses significant danger when considering the potential for wildfire; therefore, it is recommended that additional access be provided for these isolated stands. The proposed access trail can be used as an extension of the present history/nature trail allowing park visitors to hike from Lee's headquarters to Grant's headquarters without having to walk on Virginia State Route 24. This trail can also provide the necessary access for removing the overmature pines located throughout this part of the Park.

The proposed road will pass over three poorly drained sites; therefore, certain precautions must be taken to assure that these sites are not disturbed to the extent that they adversely affect the quality of the trail. Due to the

size of the area that these waterways drain, it is best to install culverts to route the water under the road. These culverts should be installed when the road is being built, prior to the use of the road for any forestry operations. There are several options for the type of culvert to be used; however, corrugated metal pipe<sup>11</sup> is probably the best method of routing the water, in each of the poorly drained areas, under the trail because these pipes are essentially maintenance-free. Once in place, each culvert should be covered with at least twelve inches of soil before the road is graded (Virginia State Water Control Board, 1979).

The proposed access road should be about 12 feet wide. An eight foot ditch should be dug along both sides of the road. The soil from these ditches should be piled onto the road surface and then graded.<sup>12</sup> This is necessary to provide for adequate drainage of the road since it occurs on relatively flat land. Lastly, four to six feet along the outside of these ditches should be cleared of shrubs and trees to insure that enough sunlight reaches the trail to

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<sup>11</sup> Either a round or a pipe arch corrugated metal pipe (CMP) can be used. The round CMP is generally less expensive; however, the pipe arch CMP generally works best in areas like these with low water flow (American Iron and Steel Institute, 1971).

<sup>12</sup> This is called a "turnpike section". It is frequently used on logging roads with minimal slope to aid in proper drainage (Walbridge et al., 1976).

dry it rapidly after storms (Figure 39). All trees which were felled to make this access road should be removed.

Once the forestry operations are completed in this region of the Park, the road, ditches and clearances should be seeded with perennial grasses or grass/legume mixtures to help stabilize these areas (Hyson et al., 1982). Before these areas are seeded, fertilizer and lime will need to be incorporated into the top 3 to 4 inches of soil.<sup>13</sup> (Appendix G contains a list of seeding mixtures applicable for the state of Virginia.)

#### Minimal Road Requirements

The following discussion outlines the minimal road requirements necessary to meet the cultural resource constraints of the Park and is an alternative to the proposed road which is discussed in the preceding section.

An opening, approximately 12 feet wide, must be cleared of all vegetation. Trees and shrubs are to be cut at groundline. The road must follow the natural contour. Culverts are not necessary; however, rock should be placed in all drainages for stability.

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<sup>13</sup> It is usually suggested that 400 pounds per acre of 10-10-10 fertilizer and 2 tons per acre of lime be applied prior to seeding (Virginia State Water Control Board, 1979).

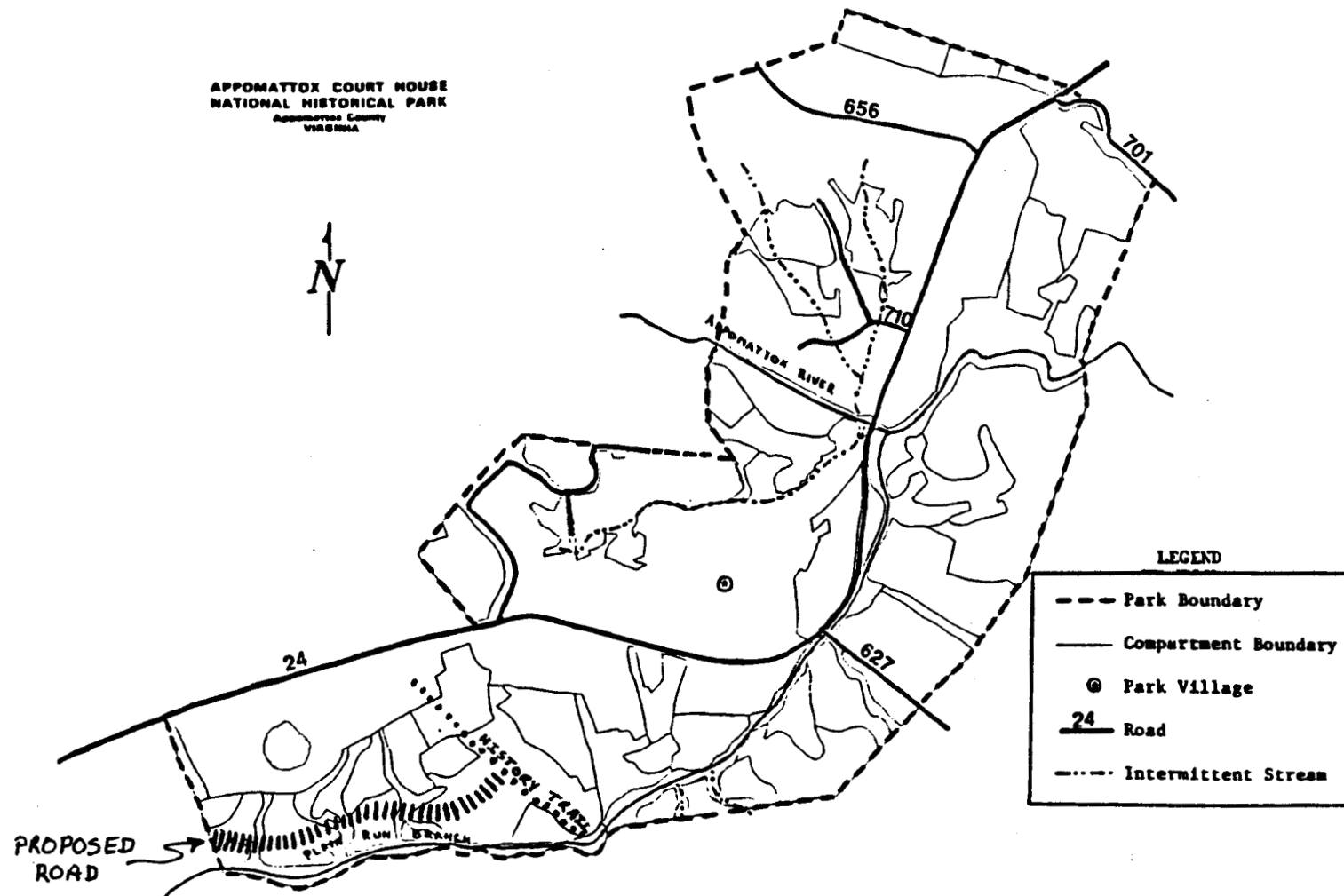


Figure 39: Location of proposed access road.

Harvesting must be confined to dry periods of the year when the soil is dry and no water is present in natural drainages. This restricts all operations to 30 - 45 days per year in late summer. The clearing should be replanted with a legume and grass mixture following completion of all forest management activities.

It is imperative that a forest engineer be consulted to design harvesting and associated road layout on the ground.

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Appendix A

LIST OF COMMON AND SCIENTIFIC NAMES OF TREES  
MENTIONED IN TEXT

List of Common and Scientific Names of Trees  
Mentioned in Text

Common Name	Scientific Name
Alder, hazel	<i>Alnus serrulata</i> Ait.
Ash, green	<i>Fraxinus pennsylvanica</i> Marsh.
Beech, American	<i>Fagus grandifolia</i> Ehrh.
Blackgum	<i>Nyssa sylvatica</i> Marsh.
Cherry, black	<i>Prunus serotina</i> Ehrh.
Dogwood, flowering	<i>Cornus florida</i> L.
Elm species	<i>Ulmus</i> spp.
Hickory species	<i>Carya</i> spp.
Hornbeam	<i>Carpinus caroliniana</i> Walt.
Locust, black	<i>Robinia pseudoacacia</i> L.
Maple, red	<i>Acer rubrum</i> L.
Oak species	<i>Quercus</i> spp.
Oak, black	<i>Quercus velutina</i> Lam.
Oak, chestnut	<i>Quercus prinus</i> L.
Oak, post	<i>Quercus stellata</i> Wangenh.
Oak, scarlet	<i>Quercus coccinea</i> Muenchh.
Oak, southern red	<i>Quercus falcata</i> Michx.
Oak, white	<i>Quercus alba</i> L.
Oak, willow	<i>Quercus phellos</i> L.
Pine, loblolly	<i>Pinus taeda</i> L.
Pine, shortleaf	<i>Pinus echinata</i> Mill.
Pine, Virginia	<i>Pinus virginiana</i> Mill.
Redcedar, eastern	<i>Juniperus virginiana</i> L.
Redbud	<i>Cercis canadensis</i> L.
Serviceberry, downy	<i>Amelanchier arborea</i> Michx.
Walnut, black	<i>Juglans nigra</i> L.
Yellow-poplar	<i>Liriodendron tulipifera</i> L.

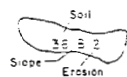
Appendix B  
SOILS INFORMATION FOR THE PARK

# LEGEND

--- PARK BOUNDARY      ○ and ○ STATE ROAD

## Soils Information for the Park

### ORDER OF SYMBOLS      SLOPE PHASES      EROSION PHASES



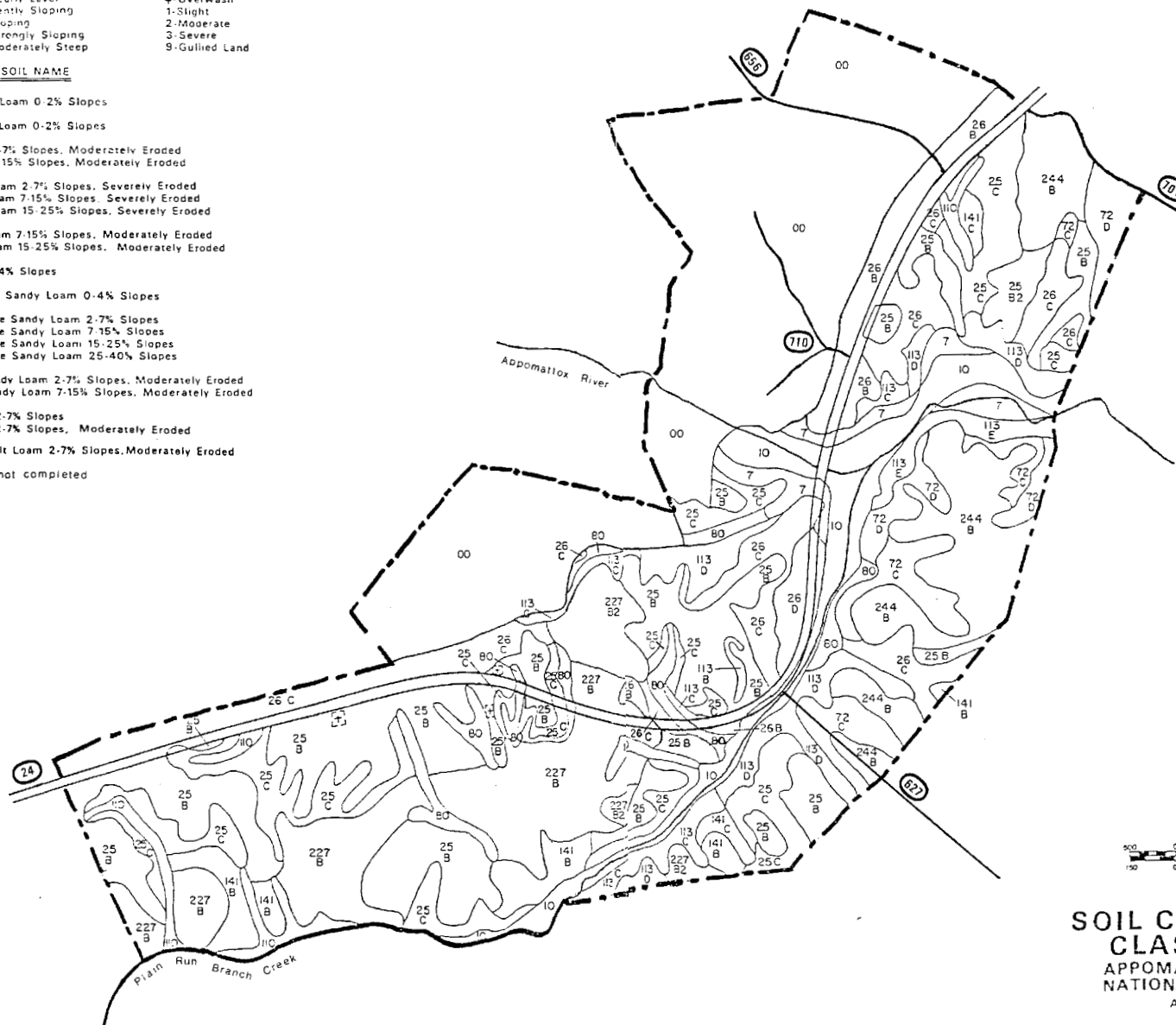
A. Nearly Level  
E. Gently Sloping  
C. S. ooping  
D. Strongly Sloping  
E. Moderately Steep

4. Overwash  
1. Slight  
2. Moderate  
3. Severe  
9. Gullied Land

### MAP SYMBOL

### SOIL NAME

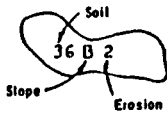
7	Chewacla Silt Loam 0-2% Slopes
10	Congaree Silt Loam 0-2% Slopes
25B	Cullen Loam 2-7% Slopes, Moderately Eroded
25C	Cullen Loam 7-15% Slopes, Moderately Eroded
26B	Cullen Clay Loam 2-7% Slopes, Severely Eroded
26C	Cullen Clay Loam 7-15% Slopes, Severely Eroded
26D	Cullen Clay Loam 15-25% Slopes, Severely Eroded
72C	Tatum Silt Loam 7-15% Slopes, Moderately Eroded
72D	Tatum Silt Loam 15-25% Slopes, Moderately Eroded
80	Starr Loam 0-4% Slopes
110	Warsham Fine Sandy Loam 0-4% Slopes
113B	Pointexter Fine Sandy Loam 2-7% Slopes
113C	Pointexter Fine Sandy Loam 7-15% Slopes
113D	Pointexter Fine Sandy Loam 15-25% Slopes
113E	Pointexter Fine Sandy Loam 25-40% Slopes
141B	Enon Fine Sandy Loam 2-7% Slopes, Moderately Eroded
141C	Enon Fine Sandy Loam 7-15% Slopes, Moderately Eroded
227B	Iredell Loam 2-7% Slopes
227B2	Iredell Loam 2-7% Slopes, Moderately Eroded
244B	Georgeville Silt Loam 2-7% Slopes, Moderately Eroded
00	Soil survey not completed



**SOIL CONDITION AND  
CLASSIFICATION**  
APPOMATTOX COURT HOUSE  
NATIONAL HISTORICAL PARK  
Appomattox County  
Virginia

## SOIL MAP

Owner: \_\_\_\_\_ Operator: Appomattox Historical Park  
 County: Appomattox State: Virginia  
 Soil survey sheet(s) or code nos. \_\_\_\_\_ Approximate scale: \_\_\_\_\_  
 Prepared by U. S. Department of Agriculture, Soil Conservation Service cooperating  
 with: Robert E. Lee Conservation District

ORDER OF SYMBOLS		SLOPE PHASES	EROSION PHASES
	36 B 2	A - Nearly level	+ - Overwash
		B - Gently sloping	1 - Slight
		C - Sloping	2 - Moderate
		D - Strongly sloping	3 - Severe
		E - Moderately steep	9 - Gullied land
		F - Steep	
SOILS ON THIS FARM			
MAP SYMBOL	SOIL NAME		
7	Chewacla silt loam 0-2% slopes		
10	Congaree silt loam 0-2% slopes		
25B	Cullen loam 2-7% slopes, moderately eroded		
C	Cullen loam 7-15% slopes, moderately eroded		
26B	Cullen clay loam 2-7% slopes, severely eroded		
C	Cullen clay loam 7-15% slopes, severely eroded		
D	Cullen clay loam 15-25% slopes, severely eroded		
72C	Tatum silt loam 7-15% slopes, moderately eroded		
D	Tatum silt loam 15-25% slopes, moderately eroded		
80	Starr loam 0-4% slopes		
110	Worsham fine sandy loam 0-4% slopes		
113B	Poindexter fine sandy loam 2-7% slopes		
C	Poindexter fine sandy loam 7-15% slopes		
D	Poindexter fine sandy loam 15-25% slopes		
E	Poindexter fine sandy loam 25-40% slopes		
141B	Enon fine sandy loam 2-7% slopes, moderately eroded		
C	Enon fine sandy loam 7-15% slopes, moderately eroded		
227B	Iredell loam 2-7% slopes		
B2	Iredell loam 2-7% slopes, moderately eroded		
244B	Georgeville silt loam 2-7% slopes, moderately eroded		

SCS-VA-87  
10/1/87

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Date: 11/1/87  
Operator: James E. S. S.  
Technician: McClung

SOIL INTERPRETATIONS FOR CROPLAND, HAYLAND, AND PASTURE

LAND SUITED FOR CULTIVATION AND OTHER USES		LAND LIMITED IN USES - GENERALLY NOT SUITED FOR CULTIVATION	
I	Soils that have few limitations which restrict their use.	V	Soils that have little or no erosion hazard, but have other limitations which are impractical to remove and limit their use largely to pasture, woodland, or wildlife food and cover.
II	Soils that have some limitations which reduce the choice of plants or require moderate conservation practices.	VI	Soils that have severe limitations which make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife food and cover.
III	Soils that have severe limitations which reduce the choice of plants, require special conservation practices, or both.	VII	Soils that have very severe limitations which make them unsuited to cultivation and restrict their use largely to grazing, woodland, or wildlife.
IV	Soils that have very severe limitations which restrict the choice of plants, require careful management, or both.	VIII	Soils and land forms that have limitations which prevent their use for commercial plant production and restrict their use to recreation, wildlife, water supply, and aesthetic purposes.

LAND CAPABILITY UNIT		
Number	Map Symbol	Description
I-1	50	Deep, nearly level, well-drained soils that have few limitations that restrict their use for cultivated crops. These soils rarely, if ever, flood.
IIe-1	25B 244B	Deep, gently sloping, well-drained soils that have moderate limitations for cultivated crops and require moderate conservation practices.
IIe-2	141B	Deep, gently sloping, moderately well-drained soils that have a dense clayey subsoil. They require moderate conservation practices and have moderate limitations for cultivated crops.
IIw-1	10	Deep, nearly level, well-drained or moderately well-drained soils on flood plains that have moderate limitations for cultivated crops because of a flood hazard.
IIIe-1	25C	Deep, sloping and gently sloping, well-drained soils that have a severe erosion hazard if they are used for cultivated crops. They require special conservation practices to prevent excessive soil loss by erosion.
IIIe-2	72C 113B	Deep to moderately deep, sloping and gently sloping soils that have severe limitations for cultivated crops because of slope or a limited available water capacity.

SCS-VA-87a  
Continuation Sheet  
10/1/65

UNITED STATES DEPARTMENT OF AGRICULTURE  
Soil Conservation Service

Date 3/05/76  
Operator Appomattox J. Park  
Technician R.E. McClenny, Jr.

SOIL INTERPRETATIONS FOR CROPLAND, HAYLAND AND PASTURE

LAND CAPABILITY UNIT

Number	Map Symbol	Description
IIIe-3	2GB	Deep, gently sloping, well-drained soils that are severely eroded. They have severe limitations for cultivated crops because of the hazard of further erosion.
IIIe-4	141C 227B	Gently sloping and sloping, moderately well-drained soils that have a dense clayey subsoil. They have severe limitations that reduce the choice of cultivated plants and require special conservation practices.
IIIn-1	7	Deep, nearly level, somewhat poorly to very poorly drained flood plain soils with a high water table during part of the year. They are subject to periodic overflow and possible ponding that limit the choice of plants and restrict the time of tillage.
IVe-1	72D	Deep, strongly sloping, well-drained soils that have very severe limitations for cultivated crops because of hazard of excessive soil loss. They require very careful management.
IVe-2	113C	Shallow to moderately deep, sloping to gently sloping, droughty soils that have very severe limitations for cultivated crops. The choice of plants is reduced and very careful management is required.
IVe-3	26C	Deep, sloping, well-drained severely eroded soils with very severe limitations for cultivated crops. They require very careful management.
IVe-4	227B2	Deep or moderately deep, gently sloping to strongly sloping, well to moderately well-drained soils with a dense clayey subsoil. They have very severe limitations for cultivated crops that restrict the choice of plants and require very careful management.
Vw	110	Nearly level, poorly drained soils, most of which have a dense clayey subsoil that is generally impractical to drain. Choice of plants is greatly reduced, and use is generally limited to pasture, woodland or wildlife.



SCS-VA-87a  
Continuation Sheet  
10/1/65

UNITED STATES DEPARTMENT OF AGRICULTURE  
Soil Conservation Service

Date 3/03/76  
Operator Appomattox H. Park  
Technician R. E. McClenny, Jr.

SOIL INTERPRETATIONS FOR CROPLAND, HAYLAND AND PASTURE

LAND CAPABILITY UNIT

Number	Map Symbol	Description
VIe-1	26D	Deep, moderately steep and steep, well-drained, mostly severely eroded soils that have severe limitations that make them generally unsuited for cultivation. They are better suited to permanent vegetation for pasture, woodland or wildlife.
VIe-2	113D	Shallow to moderately deep, sloping to moderately steep, droughty soils that have severe limitations that make them generally unsuited to cultivation. Better suited to permanent vegetation for pasture, woodland or wildlife.
VIIe-1	113E	Moderately steep to steep, severely eroded soils that have very severe limitations that make them unsuited to cultivation. They are better suited to woodland, grazing or wildlife.

SCS-VA-88  
10/1/65

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
SOIL INTERPRETATIONS FOR WOODLAND

Date 3/08/76

Operator Appomattox H. Park

Technician R.E. McClenny, Jr.

Woodland Suitability Group and Map Symbol		Estimated Growth Rate-Bd. Ft. Per Ac. Per Year						*Limitations For Use				
		Lob. Pine	Sh. Lead Pine	Va. Pine	White Pine	Oaks	Yellow Poplar	Seed Mortal.	Plant Compet.	Equipment Limit.	Erosion Hazard	Wind- throw
32	80	85+	60-69	60-69	80-89	75+	100+	1	1	1	1	1
33	7	85+	70+	70+	—	75+	85-99	1	3	1 - 2	1	1
	10											
34	110	75-84	—	50-	80-89	55-	—	2	3	3	1	1 - 2
35	113B	75-84	60-69	60-69	—	55-64	—	2	1	1	1 - 2	1
	C											
	D											
	E											
37	25B	75-84	70+	70+	90+	75+	100+	1	1	1	1	1
	C											
38	26B	65-74	60-69	60-69	70-79	55-64	70-84	3	1	3	3	2
	C											
	D											
39	72C	75-84	60-69	70+	80-89	65-74	85-99	1	1	1 - 2	1	1
	D											
	244B											
47	141B	65-74	60-69	60-69	—	55-64	70	1	2	3	1	2
	C											
49	227B	65-74	50-59	50-59	—	55-	—	2	2	3	1	2
	B2											

## LIMITATIONS FOR USE

### Seedling Mortality

1. 75 - 100% survival
2. 50 - 75% survival
3. Less than 50% survival

### Plant Competition

1. No special problem
2. Release may be needed
3. Site preparation necessary

### Equipment Limitation

1. Can use equipment year round
2. Slopes 20-50% or wetness restricts use  
( Less than 3 months )
3. Slopes less than 50% or wetness more than  
3 mos.

### Erosion Hazard

1. No problem
2. Bush and bog harrowing in lieu of bulldozing
3. Heavy equipment restricted in site preparation,  
logging, etc.

### Windthrow

1. No problem
2. Stability lessened during wet or windy periods
3. Unstable due to water table or soil restriction

<u>SOILS</u>	<u>SEPTIC TANKS</u>	<u>BUILDING &amp; FOUNDATIONS</u>	<u>STREETS &amp; PARKING</u>	<u>LAWNS &amp; LANDSCAPE</u>	<u>PICNIC AREAS</u>
Chewacla	3	3	3	3	2
Congaree 10	3	3	3	3	2
Cullen loam & Cullen clay loam 25B,C 26B,C,D	2	2	2	1	1
Tatum silt loam 72C,D	3	2	3	1	1
Starr loam 80	3	3	3	3	2
Worsham fine sandy loam 110	3	3	3	3	3
Poindexter fine sandy loam 113B,C,D,E	3	3	3	3	3
Enon fine sandy loam 141B,C	3	3	3	1	1
Iredell loam 227B,B2	3	3	3	2	2
Georgeville silt loam 244B	2	1	2	1	1

1 - Slight  
2 - Moderate  
3 - Severe

Soil and site limitation are expressed as slight, moderate and severe.

Slight means that the soil properties and site features are generally favorable for the specified use and that any limitation is minor and easily overcome.

Moderate means that some soil properties or site features are unfavorable for the rated use but can be overcome or modified by special planning and design.

Severe means that the soil properties and site features are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design or intensive maintenance is required.

## Appendix C

### GYPSY MOTH



Virginia Cooperative Extension Service

## THE GYPSY MOTH IN VIRGINIA

### AN INTRODUCTION TO A NEW PEST OF TREES

The gypsy moth, *Lymantria dispar*, was introduced into North America from Europe in 1869. Brought to Massachusetts for a breeding attempt with the silkworm, it accidentally escaped. In the 1880's, hordes of caterpillars were reported to be devouring the foliage of trees and shrubs and "marching through the neighborhoods" in Medford. The Massachusetts Department of Agriculture assisted by entomologists and other scientists developed control measures aimed at eradicating it during the last two decades of the 1900's. These moose properties suffered the ravages of the caterpillars' insatiable whim, while others who were unaffected, declined the use of arsenical poisons, threatened physical harm to workers, and tried to chop spray hoses with axes. Thus began the continuing struggle against a potentially explosive, destructive, and costly defoliator of forests, woodlands, shade trees, and other landscape plants.

The first male gypsy moth was found in Virginia in 1949, a century later. Traps containing a sex pheromone attractive to males had been used for several years to detect the presence of the insect in the state through a cooperative state-federal survey program. Since that time, more intensive detection with progressively improved lures and traps has documented the influx of gypsy moth in Virginia. Adult males have been found in more than 75 percent of the counties throughout the state. A few local infestations containing all life stages have been found in recent years, but concerted control efforts eliminated them, delaying the establishment of damaging populations.

In 1949, two critical events marked the beginning of natural spread into the state. Numerous caterpillars were found in three separate locations in Fairfax County and one in Loudoun County near infested areas to the north. Egg masses were found in two locations in Fairfax County and one each in Fauquier County and Loudoun County. Second, large numbers of males were trapped in the northern tier of Virginia counties. In contrast to approximately 1,700 males trapped statewide in 1949, nearly 30,000 were trapped in 1951. Eight northern counties reported between 1,000 and over 3,000 males each. The dramatic increase paralleled the trend in the generally infested areas of the northeast where in 1940 more than 5.1 million acres, and in 1951 more than 12 million acres, were defoliated. Never before has defoliation from gypsy moth in the U.S. been so widespread and severe. For the first time, natural spread has reached Virginia.

### DISPERSAL AND SPREAD

Dispersal and spread of gypsy moth may be either natural or artificial. Natural spread occurs as tiny caterpillars are windblown from the tops of trees where they hang on silken threads soon after they have hatched from eggs and crawled up the trees. Normally, such spread to the west and south is a few to several miles each year, limited in part by prevailing winds that tend to be westerly. Artificial spread over short or long distances results from people transporting various insect stages (primarily egg masses) from infested to non-infested areas on a wide variety of articles, plants, vehicles, and other belongings.

Several factors explain the more rapid and widespread distribution of the gypsy moth in the past two or three decades after having been confined to New England for the first 70-80 years. Since World War II, the gypsy moth has infested more and more residential areas as suburbs rapidly spread into the countryside and woodlands around urban centers. As human populations expanded, people became more affluent. They moved and traveled more frequently and greatly increased recreational activities, such as camping and vacation trips, utilizing countless campers, trailers and mobile homes. For a hitch-hiker like the gypsy moth, those changes provided unusual opportunities for dispersal. Another major factor was the change in attitude toward pesticides; insect elation in the forties and fifties at having new control methods that were highly effective, easily applied, and economical, to fear in the sixties and seventies of any chemicals, of spraying and of poisoning the environment. Changes in control policies that resulted in less effective suppression of gypsy moth, and major controversies that brought about litigation and delayed or interfered with control programs, account for much of the continued degradation from gypsy moth. In many cases, people simply failed to initiate control measures or applied them too late.

### TECHNOLOGY AND EXPERIENCE

Over the years, much has been learned about the gypsy moth and the environment. Considerable experience has been acquired in coping with complex people problems, and a multimillion dollar expanded research program has provided a broad data base of technology for an integrated pest management approach to tree protection. Thorough investigations have been conducted on the direct and indirect effect of insecticides. Biological

"insecticides" and insect growth regulators have been developed. Parasites, predators, diseases, and environmental influences are better understood and can be utilized. Pesticides and their uses have been banned, restricted, or highly regulated. Their application and pesticide applicators are subject to intensive regulation. Although continued research is needed, the challenge remains to utilize and improve our existing technology and experience thoroughly and effectively.

#### WHAT LIES AHEAD?

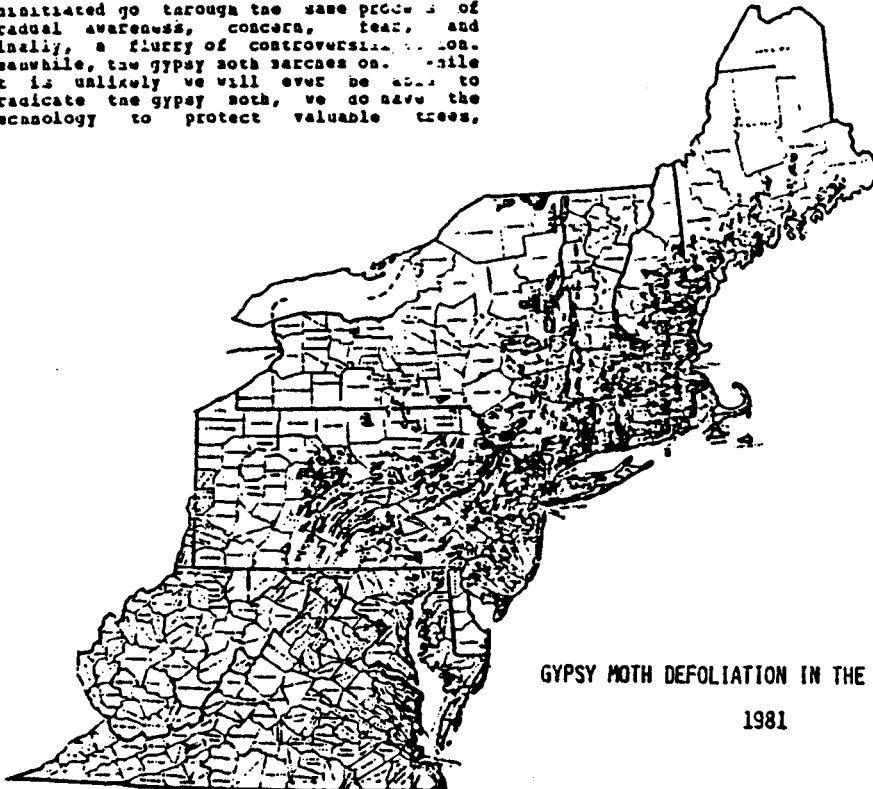
In the Northeast, gypsy moth has had sufficient time to establish itself as a native species. In Virginia, it is a newly introduced pest such as it was in Massachusetts a century ago, in Maryland over a decade ago, and in Pennsylvania two decades prior to that. There has been very little change in people's reactions to the gypsy moth. As each new area is invaded, the uninformed go through the same process of gradual awareness, concern, fear, and finally, a flurry of controversy. Meanwhile, the gypsy moth marches on. While it is unlikely we will ever be able to eradicate the gypsy moth, we do have the technology to protect valuable trees,

suppress its destruction, and delay its spread to as yet uninfested areas. The success or failure of those goals depends on the timeliness and effectiveness in implementing pest control measures based on well planned informational and educational programs.

Prepared by: John A. Reidsma, Jr.,  
Extension Entomologist  
Department of Entomology  
College of Agriculture and  
Life Sciences

In cooperation with: Virginia Gypsy Moth  
Advisory Committee.

For further information,  
contact your local County  
Extension Agent, County  
Forester, or the Virginia  
Department of Agriculture and  
Consumer Services.



GYPSY MOTH DEFOLIATION IN THE NORTHEAST

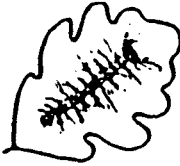
1981

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Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, and September 30, 1977, in cooperation with the U. S. Department of Agriculture, Mitchell A. Gessler, Interim Dean, Extension Division, Cooperative Extension Service, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061; M. C. Harding, Sr., Administrator, 1890 Extension Program, Virginia State University, Petersburg, Virginia 23803.





Virginia Cooperative Extension Service

## THE GYPSY MOTH IN VIRGINIA

### Recognition, Life History, and Habits

The gypsy moth (*Lymantria dispar* L.) is probably the most serious pest of forest and shade trees in the Eastern United States. A French scientist brought it to this country from Europe in 1869. He hoped to establish a new silk industry here. Unfortunately, during one of his experiments, a few of the caterpillars escaped. Our climate and woodlands provided a suitable new home for the insect, and, in the absence of natural enemies, the wild population grew rapidly. The first noticeable defoliation occurred in Medford, Massachusetts in 1889. By 1905 the infestation had spread to Connecticut; it reached New York in 1922 and Pennsylvania in 1932. Like ripples in a pond, the outbreak continues to expand. The leading edge of the generally infested area reached Northern Virginia in 1951. In the future, the gypsy moth is expected to occupy most of Virginia and eventually most of the oak forest regions east of the Great Plains.

#### Description

Gypsy moth eggs are laid in clusters called egg masses (Fig. 1). Each egg mass contains 100 to 1,000 tiny round eggs. They are scattered among the hairs of a felt-like mat which is 3/4 to 1-1/2 inches long. The buff colored egg masses are found most commonly on tree trunks, often near the base, but upper branches, rocks, stacked firewood, houses, and other stationary objects are all suitable egg laying sites.



Figure 1. Gypsy moth egg mass.

The eggs hatch into caterpillars which are initially less than 1/4 inch long. At maturity they will have grown to nearly 2-1/2 inches. Caterpillars are brownish-black and covered with tufts of long, soft hairs (Fig. 2). Older ones have three light stripes which run along their backs, and each section of the body bears a pair of colored spots. The first five pairs are blue, the last six are red.

In preparation for becoming moths, the caterpillars enter a stationary pupal stage. Pupae are brown and teardrop shaped. Unlike those of many other moths, gypsy moth pupae



Figure 2. Gypsy moth caterpillar.

are not enclosed in a woven cocoon. Female pupae are noticeably larger than male pupae.

Adult male moths are mottled brown with wingspreads of about 1-1/2 inches. Their front wings have black wavy lines and V-shaped markings (Fig. 3). Male moths have large feather-like antennae which they use to locate their mates. They are strong fliers. Female gypsy moths are larger with wingspreads of 2 to 2-1/2 inches. However, with their heavy load of eggs, they are unable to fly. The wings of females are predominantly white, but they also have black wavy lines and V-shaped markings (Fig. 3). A row of black dots lines the outer edge of each wing. Female moths have swollen abdomens which are fuzzy and tan colored.

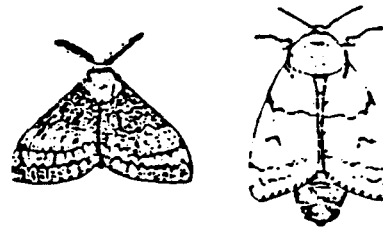


Figure 3. Male (left) and female (right) gypsy moth adults.

#### Life History

The gypsy moth has one generation each year and overwinters in the egg stage. Eggs in warm sunny places begin to hatch in April, and the hatch continues for two to three weeks. Tiny caterpillars soon climb up trees and begin feeding on the new leaves. Natural spread occurs during this stage when the small, hairy caterpillars suspend themselves on silk threads and are picked up by the wind. Usually, "ballooning" caterpillars land on nearby trees, but if the wind is favorable, they can travel several miles.

Young caterpillars chew small holes in the leaves during the day and rest on the foliage at night. In contrast, larger caterpillars feed mostly at night and crawl down the tree to rest in protected shady spots during the day. During outbreaks, however, when areas are overcrowded with mature caterpillars, they will feed day and night to try to satisfy their hunger. When full-grown, each is capable of devouring several leaves per day. This stage is present from early June through early July. Short-distance dispersal may occur at this time, when hungry caterpillars wander in search of more food or hiding places in which to pupate.

Pupation takes place behind flaps of loose bark, in tree wounds and cracks, or in similar sheltered spots. After 7 to 17 days, the adult moths emerge, first appearing in early July. Female moths crawl or flutter a short distance from their pupal cases and begin to emit a chemical (pheromone) which attracts males. Egg laying begins soon after mating, and once completed, the moths die.

#### Plants Attacked

The gypsy moth is known to feed on over 500 types of trees and shrubs. Preferred hosts include oak, willow, apple, alder, poplar, sumac, larch, birch, and many others. In addition, pine, spruce, and hemlock are fed upon by large caterpillars during severe infestations if other host plants are available nearby on which they can begin their development. Plants which are usually avoided include: arborvitae, ash, azalea, catalpa, cedar, dogwood, holly, locust, sycamore, tulip poplar, and walnut.

#### Damage

In lightly infested areas, feeding by gypsy moth caterpillars often goes unnoticed. However, in heavy infestations, all the leaves may be stripped from suitable host plants.

Deciduous trees can usually withstand one or two complete defoliations from feeding caterpillars. By mid-summer, these trees put out new leaves, but the foliage is less dense and the leaves smaller. If this happens more than two consecutive years, the food reserves of the trees will be critically low. In this condition, trees become susceptible to secondary insect pests, diseases, and drought.

Evergreen trees are much less tolerant of defoliation. Many are unable to survive a single season of heavy feeding. Among both deciduous and evergreen trees, mortality is

highest among unthrifty specimens and those growing on poor sites. Typically, gypsy moth outbreaks collapse from natural causes before large numbers of trees are killed. Feeding by caterpillars, however, reduces the growth of surviving trees by 30 to 50 percent during outbreak years.

Gypsy moth numbers in an area tend to fluctuate widely. For long periods, they may be relatively scarce, then populations increase, and they become incredibly abundant. Outbreaks normally last two to three years.

The caterpillars themselves are sometimes more of a problem than the damage they cause. During outbreaks, large numbers may wander through parks and picnic areas, across sidewalks and roads, and onto houses and other buildings. This causes understandable concern among property owners, picnickers, and others desiring to enjoy the outdoors.

#### Control

Area-wide programs sponsored by counties or municipalities are generally the most effective and most economical form of control. Large-scale control programs involve continuous monitoring of the pest. When controls are necessary, new insecticides are available which are effective and much safer than DDT for man and the environment.

Individuals whose property is not covered by an area-wide program can use manual methods as well as insecticides to help prevent defoliation of shade trees or very small woodlots. Egg masses should be painted with creosote or scraped off with a putty knife and burned or put into a container of kerosene, alcohol, or bleach. Caterpillars can be trapped under bands of burlap or other dark cloth as they move up and down trees in their daily cycle. Cut the cloth into strips about 10 inches wide. Wrap one of them around a tree, tie it in the middle with a piece of cord, and fold the top down to produce a double flap. Check the flaps daily and remove and destroy all caterpillars and pupae.

These methods and other nonchemical controls are insufficient during severe outbreaks. Contact your local Extension Agent, County Forester, or office of the Virginia Department of Agriculture and Consumer Services for more information and insecticide recommendations. Individuals wishing to protect large trees on their own property should contact a professional pesticide applicator.

Prepared by: Daniel J. Hilburn, Laboratory Specialist  
Dr. John A. Weidhaas, Extension Entomologist  
Department of Entomology  
Virginia Polytechnic Institute and State University

In cooperation with the Virginia Gypsy Moth Advisory Committee

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Appendix D  
SAMPLE DATA SHEET

## SAMPLE DATA SHEET

Stand Type \_\_\_\_\_

Plot Number \_\_\_\_\_

## I. Overstory Inventory:

A.	<u>Species</u> (name)	<u>Basal Area</u> (sq ft/acre)
----	--------------------------	-----------------------------------

B.	Total Basal Area	_____	sq ft/acre
----	------------------	-------	------------

## II. Midstory Inventory:

A.	<u>Species</u> (name)	<u>Basal Area</u> (sq ft/acre)
----	--------------------------	-----------------------------------

Sample #1

Sample #2

Sample #3

Sample #4

## B. Total Number of Occurrences of Each Species

<u>Species</u>	<u>Total Number</u>
----------------	---------------------

## C. Average Number of Occurrences of Each Species

<u>Species</u>	<u>Average Number</u>
----------------	-----------------------

## D. Average DBH of Each Species

<u>Species</u>	<u>Average DBH</u>
----------------	--------------------

## III. Regeneration Inventory:

A.	<u>Species</u>	<u>Total Number Present</u>
Sample #1		
Sample #2		
Sample #3		
Sample #4		
Sample #5		
Sample #6		
Sample #7		
Sample #8		
Sample #9		
Sample #10		
Sample #11		
Sample #12		
Sample #13		
Sample #14		
Sample #15		
Sample #16		

---

## B. Average Number of Each Species Present in Regeneration

<u>Species</u>	<u>Average Number Present</u>
----------------	-------------------------------

## IV. General Comments About Sample Plot Size:

Appendix E

PRICE LIST FOR VIRGINIA DIVISION OF FORESTRY  
SEEDLINGS



**VIRGINIA DIVISION OF FORESTRY**  
**Department of Conservation and Historic Resources**  
**TREE SEEDLING PRICE SCHEDULE**  
**1984-1985**



	1,000 and up	500	100	50
LOBLOLLY PINE	\$ 20.00	14.00		
WHITE PINE 2-0	45.00	30.00		
AUTUMN OLIVE	45.00	30.00	12.00	8.00
BLACK LOCUST	35.00	22.00		
BLACK WALNUT	220.00	150.00	55.00	35.00
BRISTLY LOCUST	55.00	35.00	12.00	8.00
CHESTNUT ASIATIC	100.00	70.00		
NORWAY SPRUCE	65.00	40.00		
RED PINE	45.00	30.00		
SAWTOOTH OAK	150.00	100.00	25.00	15.00
SCOTCH PINE	60.00	36.00		
SHORTLEAF PINE	20.00	14.00		
VA-70 SHRUB LESPEDEZA	40.00	26.00	12.00	8.00
VIRGINIA PINE	20.00	14.00		
ENVIRONMENTAL PACKAGES	(50 Loblolly-\$8.00; 50 White Pine-\$10.00)			
WILDLIFE PACKAGES	(40 Bicolor & 10 Autumn Olive) 10.00 (See Note Below)			

Prices will be reduced 50¢ per 1,000 on loads of 50,000 or more when delivery is taken at the New Kent or Augusta Forestry Centers or at the Cumberland State Forest.

**SPECIAL ORDERS** (Wildlife & Environmental Packages) will be sold subject to availability of seedlings and time restraints. Shipping will be to a central Division location. No home deliveries will be made. Availability and delivery of these packages CANNOT be guaranteed.

**SEEDLINGS ARE TO BE SOLD ONLY IN QUANTITIES LISTED ABOVE.**

Orders may be limited depending on availability. In case of shortage, sales will be limited according to the following priority: timber production, erosion control, other uses.

Your seedling orders may be placed with your local Chief Forest Warden or Area Forester, or sent to the nearest Virginia Division of Forestry office listed below.

Regional Forester, Box 198 (Bank St.), Waverly, VA 23890; (804) 834-2300  
 Regional Forester, Box 635 (509 E. Nine Mile Rd.), Sandston, VA 23150; (804) 737-4791  
 Regional Forester, Box 3758 (Corner Alderman & McCormick Rds.), Charlottesville, VA 22903; (804) 977-6555  
 Regional Forester, Box 386 (E. Third St.), Farmville, VA 23901; (804) 392-4159  
 Regional Forester, Box 100 (210 Riverland Dr.), Salem, VA 24153; (703) 389-2671  
 Regional Forester, Box D (Rt. 11, 2 miles W.), Abingdon, VA 24210; (703) 628-2791  
 Regional Forester, Box 2393 (Rt. 250 E.), Staunton, VA 24401; (703) 885-9022  
 Regional Forester, Box 3306 (3909 Airline Blvd.), Portsmouth, VA 23801; (804) 488-1921  
 Regional Forester, Box 759 (Lewis St.), Tappahannock, VA 22560; (804) 443-2211

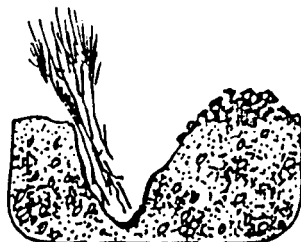
Appendix F  
PLANTING GUIDE FOR BARE-ROOTED SEEDLINGS



## Heeling In



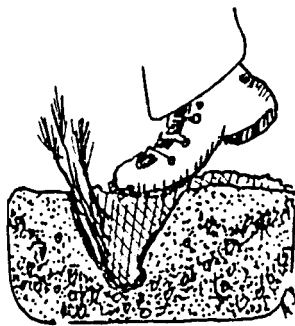
1. Dig V-shaped trench in moist shady place.



2. Break bundles and spread out evenly.

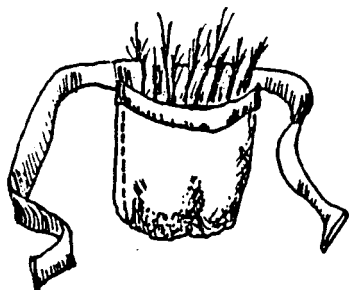


3. Fill in loose soil and water well.



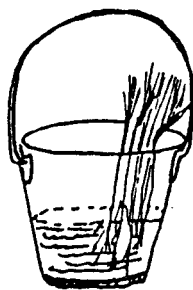
4. Complete filling in soil and firm with feet.

## Handling Seedlings in Field



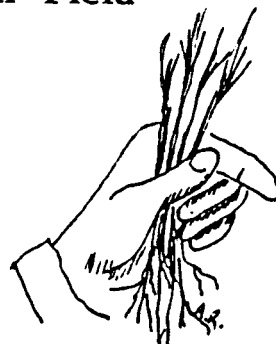
Correct

In canvas planting bag with moist peat at bottom.



Correct

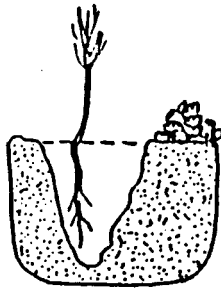
In bucket with sufficient water to cover roots.



Incorrect

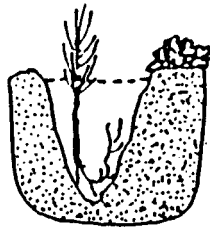
In hand-roots dry out.

## Correct And Incorrect Depths



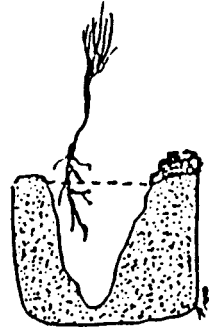
Correct

At same depth or  $\frac{1}{4}$ " deeper than seedling grew in nursery.



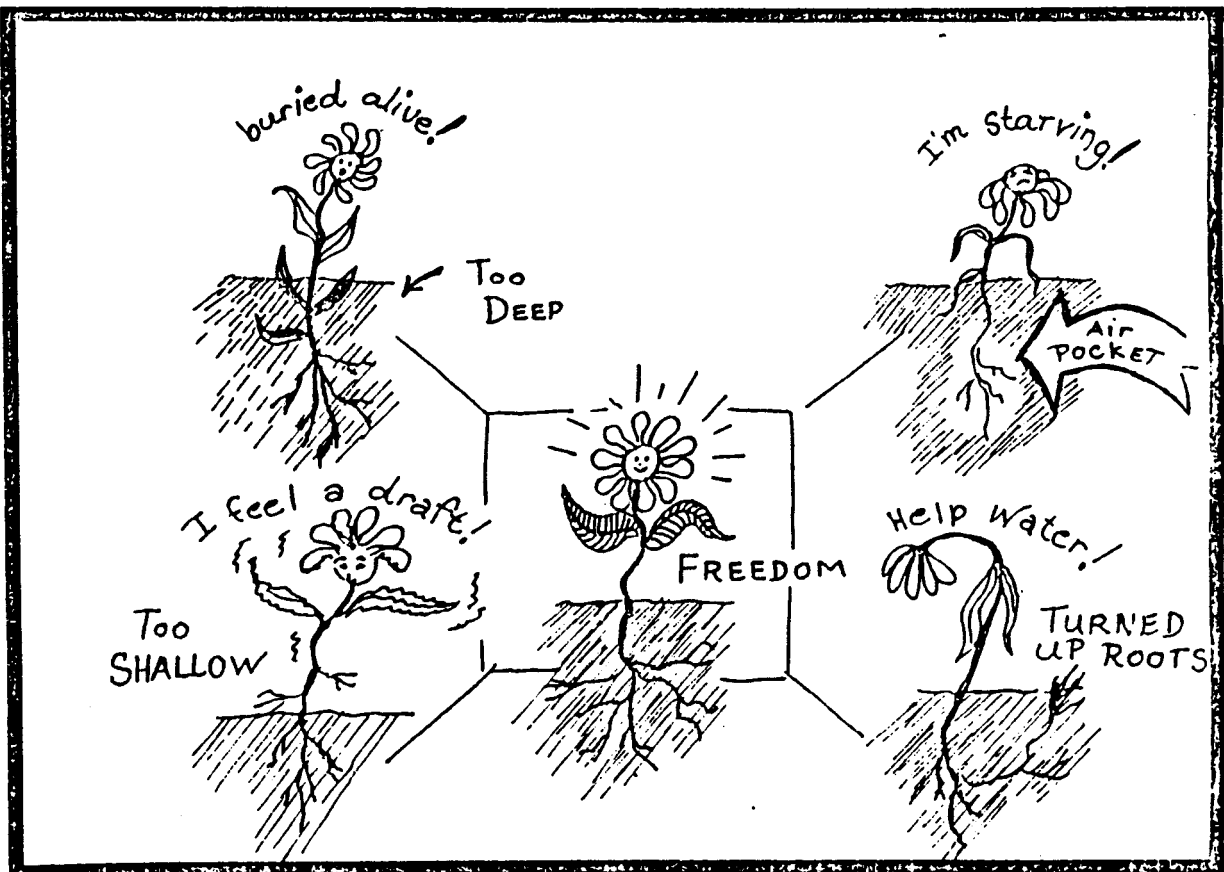
Incorrect

Too deep and roots bent.

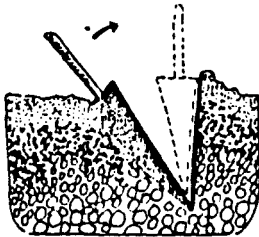


Incorrect

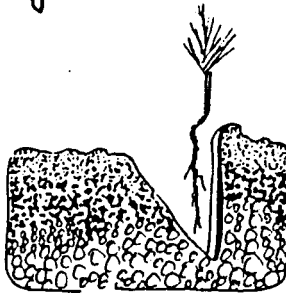
Too shallow and roots exposed.



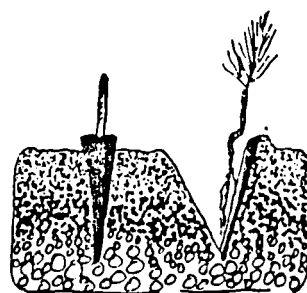
## Dibble Planting



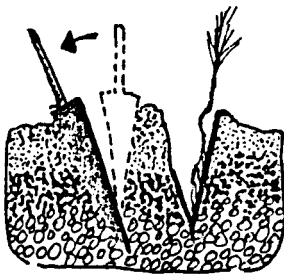
1. Insert dibble at angle shown and push forward to upright position.



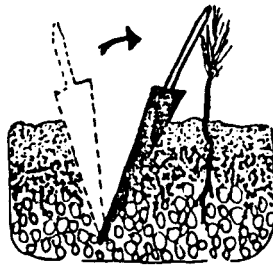
2. Remove dibble and place seedling at correct depth.



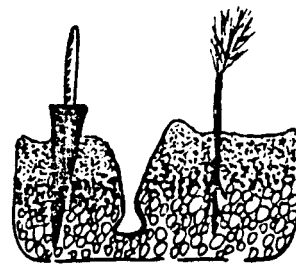
3. Insert dibble 2 inches toward planter from seedling.



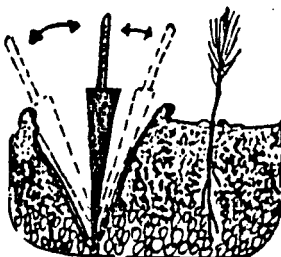
4. Pull handle of dibble toward planter firming soil at bottom of roots.



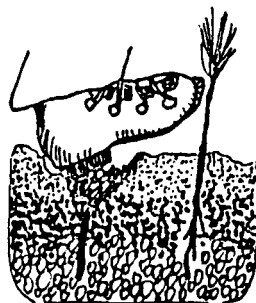
5. Push handle of dibble forward from planter firming soil at top of roots.



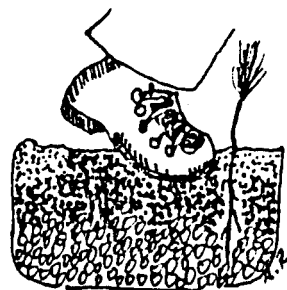
6. Insert dibble 2 inches from last hole.



7. Push forward then pull backward filling hole.

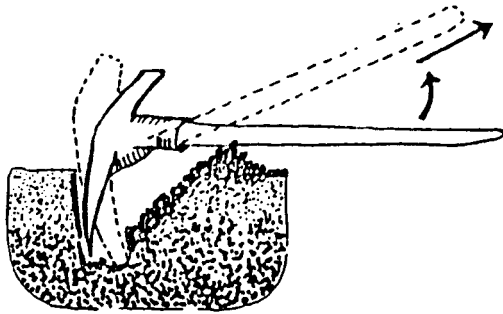


8. Fill in last hole by stamping with heel.



9. Firm soil around seedling with feet.

## Mattock Planting



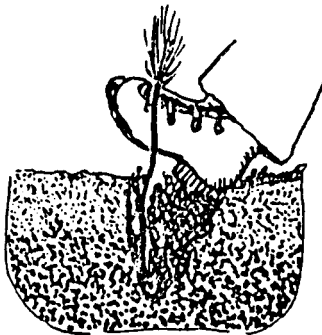
1. Insert mattock-lift handle and pull.



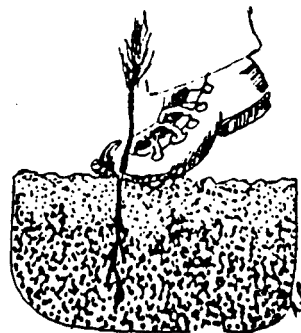
2. Place seedling along straight side at correct depth.



3. Fill in and pack soil to bottom of roots.



4. Finish filling in soil and firm with heel.



5. Firm around seedling with feet.

## Appendix G

### SEEDING MIXTURES FOR RECLAIMING LOGGING ROADS

# RATES AND DATES FOR SEEDING GRASSES AND LEGUMES FOR REVEGETATING CRITICAL AREAS

Seeding Mixtures	Seeding Rate		NORTHERN PIEDMONT AND MOUNTAINS & VALLEYS <sup>d</sup>			SOUTHERN PIEDMONT AND COASTAL PLAIN <sup>d</sup>		
	lbs/acre	Amt/1000 sq. ft.	Seeding Dates			Seeding Dates		
			Mar. 15- Apr. 15	May 1- Aug. 1	Aug. 15- Sep. 15	Mar. 1- Apr. 1	May 1- Aug. 15	Sep. 1- Oct. 1
1. Ky. 31 Tall Fescue	60	1 lb 6 oz	X	-	X	X	-	X
2. Ky. 31 Tall Fescue	60	1 lb 6 oz	-	X	-	-	X	-
Weeping Lovegrass <sup>a</sup>	2	3/4 oz	-	X	-	-	X	-
3. Ky. 31 Tall Fescue	50	1 lb 2½ oz	X	X	-	X	X	-
Korean Lespedeza <sup>b</sup>	15	5½ oz	X	X	-	X	X	-
4. Ky. 31 Tall Fescue	40	15 oz	X	X	-	X	X	-
Sericea Lespedeza <sup>b</sup>	20	7½ oz	X	X	-	X	X	-
5. Crownvetch <sup>b</sup>	15	5½ oz	X	-	X	X	-	X
Redtop	3	1 oz	X	-	X	X	-	X
6. Crownvetch <sup>b</sup>	15	5½ oz	X	-	X	X	-	X
Ky. 31 Tall Fescue	40	15 oz	X	-	X	X	-	X
7. Kentucky Bluegrass	30	11 oz	X	-	X	e	e	e
8. Orchardgrass	30	11 oz	X	-	X	X	-	X
9. Bermudagrass <sup>f</sup>								
Seed	6 PLS <sup>g</sup>	2½ oz	-	X	-	-	X	-
Sprigs	40 bu	4 bu	(Until July 1)		X	(Until July 1)		X
10. Domestic ryegrass (Temporary Cover)	20	8 oz	X	-	X	X	-	X

<u>Seeding Mixtures</u>	<u>Seeding Rate</u>		<u>NORTHERN PIEDMONT AND MOUNTAINS &amp; VALLEYS<sup>d</sup></u>			<u>SOUTHERN PIEDMONT AND COASTAL PLAIN<sup>d</sup></u>		
	lbs/acre	Amt/1000	<u>Seeding Dates</u>			<u>Seeding Dates</u>		
		sq. ft.	Mar. 15- Apr. 15	May 1- Aug. 1	Aug. 15- Sep. 15	Mar. 1- Apr. 1	May 1- Aug. 15	Sep. 1- Oct. 1
<u>Poorly Drained Areas</u>								
11. Ky. 31 Tall Fescue	40	15 oz	X	-	X	X	-	X
Reed Canarygrass <sup>c</sup>	15	5½ oz	X	-	X	X	-	X
<u>Shaded Areas</u>								
12. Ky. 31 Tall Fescue	60	1 lb 6 oz	X	-	X	X	-	X
<u>Droughty Areas</u>								
13. Ky. 31 Tall Fescue	30	11 oz	X	-	X	X	-	X
Redtop	5	1-3/4 oz	X	-	X	X	-	X
14. Weeping Lovegrass	2	3/4 oz	X	X	-	X	X	-
Sericea Lespedeza <sup>b</sup>	20	7½ oz	X	X	-	X	X	-

X - Applicable during entire period

- - Not applicable during period

<sup>a</sup> Use weeping lovegrass to provide a stand of grass for erosion control during summer

<sup>b</sup> Use acarified, inoculated seed

<sup>c</sup> Preferable to seed in fall with seed from current year's crop. This grass may clog small streams and waterways.

<sup>d</sup> Mixtures 1,3,4,5,6,7,8,11,12 and 13 may be seeded during winter months in an emergency if 2 tons per acre of a well-anchored mulch is used. These are optimum seeding dates and may be usually extended 15 days before and after with a reasonable degree of success.

<sup>e</sup> Not recommended.

<sup>f</sup> Common Bermudagrass may be seeded, sodded, sprigged, plugged or established from runners. Midland cannot be seeded.

<sup>g</sup> Pure live seed.

Source: Virginia State Water Control Board, 1979.